DOCUMENT RESUME

ED 196 773 SO 013 057

TITLE	Quantitative Understanding to Enhance Social Science Teaching. Project QUESST: Technical Report.
INSTITUTION	Educational Resources Center, Inc., Boulder, Colo.
SPONS AGENCY	National Science Foundation, Washington, D.C. Directorate for Science Education.
PUB DATE	79
GRANT	NSF-SED-77-18598
NOTE	1,075p.: Attachments 3, 4, 5, 17.2 and 21 may not reproduce clearly from EDRS due to marginal legibility of original document.
AVAILABLE FROM	Teachers College Press, Columbia University, 1234 Amsterdam Avenue, New York, New York 10022 (For revised and edited modules only).
EDRS PRICE	MF08 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Classification: Correlation: Graphs: *Interdisciplinary Approach: *Mathematics: Numbers: Percentage: Secondary Education: *Social Studies: Tables (Data): Units of Study
IDENTIFIERS	*Project QUESST

ABSTRACT

This technical project report provides the National Science Foundation with information regarding the substantive achievements of the Social Science Education Consortium's project QUESST (Quantitative Understanding To Enhance Social Science Teaching). The report begins with a discussion of materials development and project publicity. Thirty-three quantitatively oriented social science learning modules were developed for use in grades 7-12. Through a wide variety of teaching methods, the self-contained modules teach the following quantitative concepts and skills: numbers, percents, ratios, index numbers, classification, rank order, continua, central tendency, correlation, and reading graphs and tables. In one module students compare American energy consumption with the rest of the world and explore domestic energy consumption patterns. Interpretation of graphs and tables helps students to develop and evaluate the hypothesis that total energy consumption is a function of population size and standard of living, in this case measured by GNP per capita. In another module students examine two variables, health and wealth, and relate these to the degree of urbanization found in various world regions and nations. A third module, through the use of a collage of newspaper headlines, graphs, tables and case studies, examines the upward movement of wages and prices in recent years. Other social science topics dealt with in the modules include world military, American immigrants, income, inflation and the consumer price index, the energy crunch, advertising, and government revenue and expenditures. All 33 modules are included in this report. Also included in the report are a discussion of project publicity, efforts to secure a commercial publisher for the materials, and an evaluation report based on results of the project field test. (Author/RM)

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QUANTITATIVE UNDERSTANDING TO ENHANCE SOCIAL SCIENCE TEACHING

PROJECT QUESST: TECHNICAL REPORT

This technical project report is designed to provide the National Science Foundation with information regarding substantive achievements during the two years of Project QUESST funding (October 1, 1977--September 30, 1979). The report is divided into the following sections: a report on materials development and project publicity, a report on efforts to secure a commercial publisher/distributor of the project materials, an evaluation report based on results of the project field test, and a series of attachments including the educational materials developed by the project staff.

I. MATERIALS DEVELOPMENT

During the two years of project funding, the QUESST Project has achieved its goal of developing and fieldtesting 33 quantitatively-oriented social science learning modules for use at the secondary level (grades 7--12). A final report on module development and dissemination of information concerning the project is provided below.

Project Planning (10/1/77--12/31/77)

During the initial phase of the project, final decisions concerning project staff were made. (A list of project staff is provided in Attachment #1.) The staff quickly developed a cooperative, productive professional relationship which contributed to the overall success of the project. Final composition of the social science consultant panel was also determined during the planning phase of the project. (A list of project consultants is provided in Attachment #2.) The consultant group consisted of six social scientists (a representative of each discipline), an historian, a statistician, a social studies teacher, and an educator involved in the development of life-coping skills. (The specific functions of these consultants are described in the following sub-section).

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A major project activity during this planning phase was an extensive search to determine the nature and extent of current efforts to teach quantitative concepts in the social studies at the secondary level. This search encompassed major social studies texts, math and statistics texts, materials from other curriculum projects, newspaper and magazine articles, research studies, and reports from consumer agencies. The search and materials analysis familiarized project staff with a range of mathematical and statistical concepts which could be used in developing modules. The analysis of social studies texts helped to determine secondary social studies topics which could be readily infused with a quantitative treatment. Additionally, the search generated quantitative data which could be incorporated in module development. The search for appropriate quantitative data, of course, continued throughout the curriculum development process.

Project Consultant Work (1/1/78--2/28/78)

The major function of the social science consultant group was to identify key quantitative concepts and skills used in their respective disciplines. A four-step procedure was used to accomplish this goal: First, each consultant completed a form to identify, define, and rate the quantitative concepts and skills used in their discipline. Additionally, they identified what they believed secondary students should know or be able to do related to important quantitative concepts and skills. (Attachment #3), provides an example of the completed forms.) Secondly, a review of all of the forms by each member of the consultant group resulted in a synthesis of the main ideas from each discipline. (Attachment #4 is an example of a synthesis report.) Then, utilizing ideas from these sources, the project staff developed a framework to organize and select the quantitative concepts and skills to be used in Project QUESST. (See Attachment #5.) Finally, in two separate conferences held at the SSEC facilities in Boulder, Colorado during January, 1978, this framework was presented to the social science consultant panel for review and comments. Additional conference activities included discussion of grade level and topical placement of the quantitative concepts in the social studies curriculum, sources of quantitative data, and possible formats for the modules. A significant activity was the discussion and development of rough outlines for 20 proposed learning modules. The conferences were highly productive and contributed to the successful development of the final project modules.

The major function of the social studies teacher consultants was to suggest social studies issues and topics for which they believed that quantitative learning activities might be useful. Additionally, we desired to determine teacher attitudes toward teaching quantitative concepts in the social studies classroom. Lastly, we were seeking teacher's ideas concerning desired module format (length of time, procedures, student materials, etc.). An interview schedule was developed and used to gather this information. (See Attachment #6 for a copy of the interview instrument.) The sample of social studies teachers included 40 teachers from a number of large-city urban junior high schools, a large suburban high school, a small-city junior high school and high school, and a consolidated rural junior and senior high school. (See Attachment #7 for a complete list of teachers and schools.) The attitude of most teacher consultants was that although they lacked a background in quantitative concepts and skills, and in some cases felt anxious about introducing these in their social studies clsssroom, they did believe that it was important for students to learn quantitative concepts and skills applicable to coping in a technological society or preparatory for college-level studies in a social science discipline. Of the classroom teachers interviewed, 90 percent indicated an interest in participating in the pilot test of the project materials.

Project Modules: Pilot Development (3/1/78--5/31/78)

Based upon the work of the project staff with the two consultant groups, it was decided that the quantitative content of the modules should deal with basic quantitative concepts and skills: numbers; percents, ratios, and index numbers; classification; rank order; continua; central tendency; correlation; and reading graphs and tables. It was the consensus of the project consultants and staff that these quantitative concepts and skills were both the most important and applicable for secondary social studies. (Attachment #8 further identifies each quantitative idea.)

The classroom teachers with whom we talked also emphasized that the project materials: 1) Should be short 1-3 day lessons, 2) Should focus on issues and topics applicable to the existing social studies curriculum, 3) Should include suggested teaching procedures and all necessary student materials, and 4) Could profitably be developed in topical clusters rather than dealing with a large number of completely separate topics.

The project staff decided to develop a series of one- to three-day modules clustered around seven social studies issue areas, including American government, economic issues, energy issues, family and consumer issues, population patterns, American lifestyles, global issues. A basic quantitative skills cluster for the social studies was also developed. Pilot modules were designed around four issues concerning economics, energy, global comparisons, and quantitative understanding. Each of these four pilot modules was designed in a separate, distinct format. The objective of this pilot test was to select a final format for module development, and to receive comments from classroom teachers on their degree of satisfaction with the amount of teaching procedures planned for inclusion in the materials. The four modules were each pilot tested by two teachers in the greater Denver area. Additionally, each module was critiqued, but not tested in the classroom, by three teachers in the Denver area. (See Attachment #9 for a copy of the review form.) Finally, each of the four modules was tested in the classroom by a member of the project staff.

Project Modules: Development (6/1/78--12/31/78)

Based upon the results of the pilot test, the project staff finalized the module format and content framework. In June 1978 the staff met and finalized the indentification of modules to be developed, and the social studies and quantitative concepts to be included in each module. (See Attachment #10 for a list of topics, titles, and concepts.) Outlines of each proposed module were prepared and then reviewed by the project staff. As a result of this review process, suggestions for revisions were incorporated in the first working drafts and made suggestions for additional revisions. All modules were completed in fieldtest form by January, 1979.

During this development phase of the project the staff selected fieldtest sites and identified fieldtest teachers at each location. The three fieldtest sites selected were the metropolitan Boston, Denver, and Minneapolis areas. During this period the project evaluation instruments were designed and fieldtest procedures established. (Evaluation instruments, procedures, and results are described in section three of this report.)

At this time, the Project QUESST staff also took initial steps to disseminate information about the project to social studies educators. An article describing the project appeared in the November 1978 issue of the Journal of the New York State Council for the Social Studies. (See Attachment #11.1.)

Project QUESST: Final Phase (1/1/79--9/30/79)

From January through May, 1979 the Project QUESST modules were field tested in grades 7-12, by 51 teachers at selected sites in the Boston, Denver, and Minneapolis areas. The field test, using control and experimental classes, involved pre- and post-test of students' affective and cognitive changes, staff interviews of participating students and teachers, and classroom observations by project staff. (Section three of this report describes in detail the evaluation process.) Field test results were reviewed by the entire staff and formed a basis for the final revision of the project materials. The modules were revised and produced in final form by September 30, 1979. (Attachment #12 includes copies of each module developed by Project QUESST.)

During this final phase, the project staff continued dissemination of information about the project. Workshop presentations on Project QUESST were made at the Northeast (Boston), Southeast (Memphis), and Rocky Mountain (Denver) regional meetings of the National Council for the Social Studies. A presentation was also made at the annual meeting of the California Council for the Social Studies (San Francisco.) At the request of the National Science Foundation, workshop presentations were also made at NSF Project Directors meetings held in Dallas, Texas and Denver, Colorado. Additionally, articles describing the project were published in The Link and the Journal

Educational Technology Systems. (See Attachment #s 11.2 and 11.3 for these two articles.)

Due in large part to the workshop presentations and journal articles, the project staff has received and responded to more than one hundred and 50 requests from 30 states and three foreign countries for information concerning the Project QUESST materials. Upon receipt of the Link article describing the modules and one sample module, numerous classroom teachers and district social studies supervisors requested to be informed when the materials are commercially available for classroom use.

II. MATERIALS PUBLICATION

In accordance with National Science Foundation guidelines, a Project QUESST publication plan was developed and submitted to the Division of Grants and Contracts in March, 1979. Permission to proceed with the proposed publication plan was not received until August, 1979. This lengthy delay was due to internal problems within the Grants and Contracts division. In September, 1979 a letter announcing the successful completion of Project QUESST was sent to over 80 educational publishers to solicit their interest in publishing and distributing the project modules. (Attachments #13 and #14 include the publisher solicitation letter and a listing of those publishers contacted.) Additionally, a solicitation of prospective publishers was placed in the trade journal, Publishers' Weekly. (Attachment #15 contains this notice.) As of November 30, 1979, 13 commercial publishers had indicated an interest in the project materials and had requested additional details. (Attachment #16 lists these publishers.) Requesting publishing houses received a copy of the National Science Foundation guidelines (NSF Circular No. 123) and three examples of the learning modules developed by the Project QUESST staff. A deadline of January 1, 1980 was set for receipt by the Educational Resources Center of publication proposals from prospective publishers. On the deadline date, proposals had been received from ETC Publications, Palm Springs, California and Teachers College Press, Columbia University, New York, New York (Attachment #17 contains copies of the two publication proposals.) Based upon National Science Foundation guidelines, and with NSF approval, the Educational Resources Center selected Teachers College Press to publish and distribute the Project QUESST materials. (Attachment #18 contains the publication agreement.) The project materials were delivered to Teachers College Press in May, 1980. Teachers College Press expects to release the materials to the commercial market in January, 1981.

III. PROJECT EVALUATION

The evaluation section of this report consists of three sub-sections. Part one will provide a general introduction to the fieldtest design, instrument, sample selection, and procedures of analysis. Part two will provide a brief summary of the fieldtest results. An attachment (part three) presents and in-depth review of fieldtest results analyzed by module cluster (Attachment #24.)

Fieldtest Procedures

The learning modules developed by Project QUESST were fieldtested in 25 schools located in the metropolitan Boston, Massachusetts; Denver, Colorado; and Minneapolis, Minnesota areas. Fifty one social studies teachers at the secondary (grades 7-12) level in these three areas were selected to teach a group of three to four topically related modules (a module cluster). Each teacher taught at least one class using the project materials, and maintained one class as a control comparison group. Teachers involved in the fieldtest procedures were asked to sign an agreement form and to provide basic teacher background information. (See Attachment #19.)

Thirty eight fieldtest teachers completed instruction of their module cluster, and returned both knowledge and attitude pretest and posttests for their experimental and control group classes. In all, 1,745 secondary students were involved in a completed fieldtest process. The sample was evenly distributed between male (n=884) and female (n=861) students. Table 1 indicates the distribution of students at each grade level for each cluster of QUESST modules. (Clusters were identified in Attachment #10.)

TABLE 1.

Distribution of Field Test Students
By Grade Level for Each Cluster

GRADE	CLUSTER								
	One	Two	Three	Four	Five	Six	Seven	Eight	Totals
Seventh	121		38		105	185			449
Eighth		48	85	138	18		51		336
Ninth		17	44			62	46	28	197
Tenth		83			33		42	33	191
Eleventh		62	62	25			59	84	292
Twelfth		53		55	27	41	20	84	280
Totals	121	259	229	218	183	288	218	229	1745

Table 1 shows that seventh graders (n-449) were the most numerous subgroup in the sample, while tenth graders (n-191) were the smallest subgroup. Module cluster one was field tested only by seventh graders, while all other module clusters were field tested by students at three or more grade levels.

Students who participated in the fieldtest process were required to complete both a knowledge and an attitude pretest and posttest, in addition to an activity feedback form. The knowledge test was a 25 item machine-scored multiple choice test. The items on each test were tailored to the content taught in the module cluster which the students were using. Each test contained items designed to assess the conceptual and definitional aspects of the quantitative content used in the modules. A few of the items contained on each test required simple calculations in order to obtain the correct answer. An estimate of the reliability (Chronbach's alpha) of each cluster's knowledge test was obtained for the pretest and the posttest results. Pretest reliabilities ranged from $\alpha=.50$ up to $\alpha=.83$ and averaged $\alpha=.70$. Posttest reliabilities calculated on these same tests range from $\alpha=.71$ up to $\alpha=.86$ and averaged $\alpha=.78$. (Each cluster's knowledge test is provided in Attachment #20, along with a teacher's test manual.)

The attitude test completed by each student was a machine-scored instrument composed of 27 Likert-format items designed to assess affective reactions toward the use of statistics both in social studies and in everyday living. Sixteen separate estimates of the reliability (Chronbach's alpha) of the instrument produced results varying between $\alpha=.88$ and $\alpha=.92$. (A copy of the attitude instrument is provided in Attachment #20.)

In addition to completing knowledge and attitude tests, students were asked to complete a student feedback form. (See Attachment #21.) This form provided information about each student's background in mathematics, and also solicited open ended responses to such questions as:

--Which activities did you like least? Why?

--Did the materials raise any important or interesting questions? If so, what were they?

The students' responses to these and other questions are exemplified in the third sub-section of this report. (See Attachment #24.)

Three types of additional information were collected as a part of the fieldtest in order to assist in the revision of the modules. First, teachers were asked to complete an open-ended feedback form designed to measure their reactions to the modules (see Attachment #22). Their responses to the questions on this instrument are illustrated in the third sub-section of this report. Second, structured classroom observations were conducted by the project staff. The primary purpose of these observations (see Attachment #23) was to verify the quality of the classroom implementation of the modules. A final type of information was gained through informal interviews with several of the fieldtest teachers in the Denver and Boston areas.

Collected knowledge and attitude test data were subjected to analysis of covariance and multiple non-parametric tests using version 7.0 of SPSS-6000. Results obtained from these statistical procedures are summarized in the following sub-section.

Fieldtest Results

Data from each of the eight module clusters (the clusters were identified in Attachment #10) were analyzed separately. Each analysis of covariance assessed the effect of initial differences in the pretest scores between the experimental and control groups. This analysis also determined the degree of variation present in the posttest scores which could be attributed to any of the assessed factors, including sex, grade level, experimental vs control group membership, and teacher and class characteristics. Table 2 displays a summary of the presence of a treatment effect both for knowledge and attitude tests for each of the eight module clusters.

Table 2

Summary of Significant Treatment Effects*

Cluster	Knowledge Test	Attitude Test
1	Sig.	n.c.
2	Sig.	n.s.
3	n.s.	n.s.
4	Sig.	n.s.
5	Sig.	n.s.
6	Sig.	n.s.
7	n.s.	n.s.
8	Sig.	n.s.

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*$p < .01$

As may be seen in Table 2, six of the eight module clusters were shown to have significant knowledge test treatment effects. Only module clusters three and seven failed to show a significant treatment effect on the students' knowledge test. In contrast to the knowledge test results, the eight module clusters failed to indicate a significant treatment effect on the students attitudes.

The table below (Table 3) displays the results of nonparametric tests conducted to determine whether significant differences existed between the combined experimental and control groups, and between the pretest and posttest scores of the combined experimental and control groups.

Table 3

Summary of Significant Nonparametric Contrasts Conducted on the Knowledge Tests*

	Exp-Ctrl Group Posttest Comparison	Pre-Post Exp Group	Pre-Post Ctrl Group
1	Sig. E>C	Sig. Pos.	N.S.
2	Sig. E>C	Sig. Pos.	Sig. Pos.
3	N.S.	N.S.	N.S.
4	Sig. E>C	Sig. Pos.	N.S.
5	N.S.	Sig. Pos.	N.S.
6	Sig. E>C	Sig. Pos.	N.S.
7	N.S.	N.S.	N.S.
8	Sig. E>C	Sig. Pos.	N.S.

* $p < .01$

Table 3 shows that the experimental (treatment) group outperformed the control group on posttest knowledge scores for five of the eight clusters. Looking at the pretest-posttest gains of the experimental group, we see a similar pattern, with six of the eight clusters having experimental groups which experienced significant knowledge test gains.

The reader may see that one control group also evidenced significant positive gains between the pretest and the posttest. This gain might be attributed to contamination or other incidental learning which took place during the course of module implementation.

The pattern of the analysis of covariance results and the nonparametric tests supports the judgment that six of the eight module clusters were effective in causing increases in students' statistical knowledge as measured by the 25-item knowledge test. It may also be concluded that the module clusters appear not to have been effective in significantly altering students' attitudes toward the use of statistics in the social studies or in everyday living. The two module clusters which failed to demonstrate a treatment effect on the analysis of covariance also failed to show significant results on any of the combined nonparametric tests conducted. Nonparametric tests conducted on the combined experimental group attitude test results failed to show any significant positive results. This finding is consistent with the analysis of covariance finding of no treatment effect for the attitude test.

A detailed cluster by cluster analysis comprises the third sub-section of the evaluation report. This analysis is found in Attachment #24.

ATTACHMENTS

1. Project QUESST Staff
2. Social Science Consultants
3. Quantitative Concepts: Consultant Forms
4. Dr. Larsen's Synthesis Report
5. Quantitative Concepts: A Structure
6. QUESST Teacher Interview Schedule
7. Teachers and Schools
8. Quantitative Concepts
9. Instructor Evaluation Form
10. Topics, Titles, and Concepts
11. Project QUESST Articles
12. Project QUESST Modules
13. Publishers: Project Announcement Letter
14. Publishers: Initial Contact
15. Solicitation Notice: Publisher's Weekly
16. Potential Project Publishers
17. Publisher Proposals
18. Publication Agreement
19. Fieldtest Teacher Agreement Form
20. Project Fieldtests and Test Manual
21. Student Feedback Form
22. Teacher Feedback Form
23. Classroom Observation Schedule
24. Field Test Analysis: Cluster Reports

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ATTACHMENT #1

PROJECT QUESST STAFF

1. Dr. Irving Morrissett, Project Director.
2. Dr. Douglas Superka, Project Coordinator (year 1) and Curriculum Developer.
3. Mr. Bruce Tipple, Project Coordinator (year 2) and Curriculum Developer.
4. Dr. Kenneth Switzer, Project Coordinator (year 2) and Curriculum Developer.
5. Dr. Dale Greenawald, Staff Associate and Curriculum Developer.
6. Dr. John Hoge, Staff Associate and Evaluation Specialist.
7. Mr. Paul Mulloy, Teacher Associate and Curriculum Writer.
8. Ms. Ann Williams, Staff Associate and Editor.
9. Ms. Joanne Anglesano, Project Secretary.
10. Mr. Edward Ross, Mathematics Consultant.

SOCIAL SCIENCE CONSULTANTS

1. Dr. William Crozier, Professor of History, St. Mary's College, Winona, Minnesota.
2. Dr. J. Ross Eshleman, Professor of Sociology, Wayne State University, Detroit, Michigan.
3. Dr. James Harf, Associate Professor of Political Science, Ohio State University, Columbus, Ohio.
4. Mr. Richard Hulsart, Life-Coping Skills Specialist, Education Commission of the States, Denver, Colorado.
5. Dr. Richard Larsen, Associate Professor of Mathematics and Statistics, Vanderbilt University, Nashville, Tennessee.
6. Dr. Janet Moore, Associate Professor of Anthropology, University of Colorado at Denver, Denver, Colorado.
7. Dr. Lawrence Singell, Professor of Economics, University of Colorado, Boulder, Colorado.
8. Dr. Judith Torney, Professor of Psychology, University of Illinois at Chicago Circle, Chicago, Illinois.
9. Dr. George Vuicich, Professor of Geography, Western Michigan University, Kalamazoo, Michigan.

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ATTACHMENT #3

QUANTITATIVE CONCEPTS: CONSULTANT FORMS

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ATTACHMENT #3

CHART I

QUANTITATIVE CONCEPTS IN THE SOCIAL SCIENCES

Your name J. Ross Eshleman

Your social science SOCIOLOGY

	A	B	C	D	E	F
Quantitative Concepts	Common Concepts	Needed for Career	Needed for Citizenship	Most Neglected	Most Important	Comments
Science	x	x	x			Natural/physical science taught and understood early. Social phenomena as science comes later if at all.
Methods of Observation	x	x	x		x	
Research Design	x	x	x	x		
Probability	x	x	x		x	General idea should come early.
Causality	x	x	x			
Concepts/ Variables	x	x	x		x	
Hypotheses, Propositions, Theory	x	x	x	x	x	More advanced level. General statements of interrelationships - earlier.
Sampling	x	x	x			
Descriptive Statistics	x	x	x	x	x	Certain statistics early (%'s, means) others later (St. Dev., etc.)
Inferential Statistics	x	x	x	x	x	Probably to be taught a bit later, particularly more sophisticated statistics. General idea important irrespective of technical skill.
Levels of Measurement	x	x	x	x		

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CHART II

QUANTITATIVE SKILLS IN THE SOCIAL SCIENCES

Your name J. Ross Eshleman

Your social science SOCIOLOGY

	A	B	C	D	E	F
Quantitative Skills	Common Skills	Needed for Career	Needed for Citizenship	Most Neglected	Most Important	Comments
Basic Math Skills	x	x	x		x	Basic skills need to be taught early. More advanced ones later.
Graph Construction & Interpretation.	x	x	x	x	x	
Table Construction & Interpretation.	x	x	x	x	x	Extremely important skill for most of the social sciences.
Interviewing techniques	x	x	x			A skill useful for purposes other than survey research.
Locating social type data	x	x	x			
Understanding levels of significance	x	x	x	x		Basic to being able to understand any quantitative research published.

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Social Science SOCIOLOGY

Quantitative Concept Science

1. What is it that secondary students should know about this quantitative concept?

Students are exposed to science from elementary on. However many students never are able to perceive of social matters as "science". What should they know?

- The scientific method as applied to the social sciences including basic steps in social research
- How science relates to metaphysics, epistemology and ethics.
- Characteristics of a scientific approach including concepts such as empiricism, propositional, operational definitions, abstractions, systems and systemic relationships, and the like.

2. Give an example of how knowledge of this concept is directly relevant to students' lives?

This concept is relevant in illustrating that:

- there is nothing magical or mystical about science
- social matters are observable, patterned, recurrent, testable
- not all knowledge is or can be gained through science but knowledge that is, is extremely useful in directing behavior, problem solving, organizational development, change, and the like.

3. Please make any other comments about this concept which you think are important for us to know.

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Social Science SOCIOLOGY

Quantitative Concept Methods of observation

1. What is it that secondary students should know about this quantitative concept?

All of life is based on observation. There are both standardized and non-standardized, structured and unstructured methods of observing. Both may be useful but unstructured methods are likely to be less useful for statistical treatment and more likely to include the bias of the researcher. Yet, in contrast to the survey and structured approaches, an unstructured approach is not bound by the questions at hand, can probe and follow the "meaningful areas" of investigation, can modify categories, impute motives and feelings, and can probe difficult to quantify variables.

Methods of observation should include:

- those eliciting response from subjects (questionnaires, schedules, interview guides)
- those using human or mechanical observers (participant observers, judges, cameras, tape recorders, etc.)
- physical-trace evidence (census reports, company files, sales receipts, etc.)

2. Give an example of how knowledge of this concept is directly relevant to students' lives?

- Relating personal observations to empirical world and research data.
- Separating the observer from the observed.
- Analyzing textbooks, survey reports.
- Questionning newspaper accounts and personal reports.
- Knowing how to "find" as well as interpret data.

3. Please make any other comments about this concept which you think are important for us to know.

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Social Science SOCIOLOGY

Quantitative Concept Research design

1. What is it that secondary students should know about this quantitative concept?

In a general sense, this refers to the entire process of planning and carrying out a research study: the design of hypotheses, design of sample, design of instruments, design of administration, and design of analysis. However, at this point, students should be aware of a variety of designs such as the case study, survey, longitudinal, ex post factor, experimental and the like. Of particular significance to students are the advantages as well as limitations of using the "one-shot" case, the frequently used survey, and the more controlled experiment.

2. Give an example of how knowledge of this concept is directly relevant to students' lives?

- Danger of generalizing from case examples.

- Relevance of understanding frequently cited survey results such as political polls, public opinion surveys, market research surveys, commercial surveys, etc.

3. Please make any other comments about this concept which you think are important for us to know.

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Social Science SOCIOLOGY

Quantitative Concept Probability

1. What is it that secondary students should know about this quantitative concept?

Probability is "probably" the most central concept to both theoretical and applied statistical analysis. Students should know it refers to the long-range proportion of times an event occurs - its relative frequences. They need to differentiate between a one-time occurrence and an outcome over the long run.

2. Give an example of how knowledge of this concept is directly relevant to students' lives.

Probability examples relevant to students lives.

The likelihood of:
- getting pregnant
- having a male or female birth
- passing a subject
- going to and getting accepted into college
- getting married and/or divorced
- living until a certain age

Predicting outcomes of stock movements, horse races, football games.

Insurance rates.

3. Please make any other comments about this concept which you think are important for us to know.

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QUESST Project

Social Science SOCIOLOGY

Quantitative Concept Causality

1. What is it that secondary students should know about this quantitative concept?

This concept could fit into a discussion of numerous other concepts: correlation, association, hypotheses, relationships, etc. However, it appears to be central to the establishing of "scientific laws" and students need to differentiate cause from simply any relationship. Particularly in the social sciences, two variables may be highly related but the precise cause is not unequivocally established. (Ex. those who smoke heroin or morphine probably also have smoked marijuana but its not very clearly established that one causes the other. The same pattern seems to exist in Michigan between drowning rates and the sale of ice cream).

From a discussion of this concept could come a discussion of explanation, prediction, association, temporal order of events, intervening variables, multiple and indirect causes, and arrow diagrams.

2. Give an example of how knowledge of this concept is directly relevant to students' lives?

Relevance comes in:

- separating or differentiating cause from correlation
- understanding the temporal order of certain events
- noting alternative causes and intervening factors

Examples: The "cause" of crime, homosexuality, alcoholism, suicide, divorce, rape, pregnancy, wealth, talent, etc.

3. Please make any other comments about this concept which you think are important for us to know.

10/77

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Social Science SOCIOLOGY

Quantitative Concept Concepts/Variable

1. What is it that secondary students should know about this quantitative concept?

Within a symbolic interaction frame of reference, concepts (terms) are symbols for meanings that determine some aspect of reality and determine what is perceived. Shared meanings are that which make social life possible. For research purposes, abstract concepts need to be defined "operationally". Certain concepts refer to phenomena that vary in some manner (variables). Variables may be independent or dependent, the perceived cause or perceived effect. Variables may be categorical (parenthood) or continuous (height). Relationships between variables (including their possible existence, their direction as to positive or negative, their shape as to linear or curvilinear, and their amount of influence or the variation they "cause" or explain. These are things secondary students should know. Other types of quantitative variables (nominal, ordinal, interval, ratio) are discussed under "Levels of Measurement".

2. Give an example of how knowledge of this concept is directly relevant to students' lives?

Concepts and variables such as those mentioned above are relevant for:
-their impact on decision-making
-the importance of words and choosing the "right" concepts
-understanding social and abstract phenomena
-dealing with the measurement of an abstract concept
-noting that which "causes" and is "caused"
-the analysis of relationships

In addition to use for research purposes, this seems particularly significant when applied to political speeches, religious orations, economic interrelationships, dealing with any abstraction or shared meaning, or understanding any type of relationship.

3. Please make any other comments about this concept which you think are important for us to know.

10/77

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Social Science SOCIOLOGY

Quantitative Concept Hypotheses, Propositons, Theory

1. What is it that secondary students should know about this quantitative concept?

These concepts could well be linked in with an extension of the concept/variable dimension. Students should know what hypotheses and propositions are, the relationship between theory and data, and the significance and use of each in both empirical research and day to day existence.

Students should also be able to differentiate between inductive and deductive approaches, theory, and explanations.

2. Give an example of how knowledge of this concept is directly relevant to students' lives?

In day to day existence, our behavior is influenced by our "theories" (interrelated propositions) of childrearing, teacher behavior, friendship patterns, etc. For example if we believe in the proposition that discipline is directly related to corporal punishment this is likely to affect personal behavior, our understanding of the "undisciplined", and our policy orientation. These propositions may or may not be supported but establish guidelines for establishing hypotheses for testing and provide a link to empirical data.

Ex's Durkheim: "Social Solidarity is inversely related to suicide rates."
Weber: "Protestant Work Ethic is directly related to Capitalistic organizatic
Eshleman: "Production of Quantitative Materials for secondary schools is positively related to more effective teaching which is positively related to student effectiveness in decision-making."

3. Please make any other comments about this concept which you think are important for us to know.

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Social Science SOCIOLOGY

Quantitative Concept Sampling

1. What is it that secondary students should know about this quantitative concept?

Students should know that most of our observations, beliefs, and decisions are based on or result from limited bodies of data. Since we can't observe or study all people, communities, or societies, we select a segment, part or sample of the total and generalize to larger populations.

Representativeness is a key concept in dealing with sampling. It may be useful to deal with sampling bias and error in discussing this concept. Differentiation can also be made between various types of sampling: random, quota, cluster, stratified, volunteer, purposive, multistage, etc.

2. Give an example of how knowledge of this concept is directly relevant to students' lives?

In drawing inferences from survey data reported in the mass media or elsewhere. Example: Currently publicity is being given to Redbook's poll on sexual life and preferenc of women. It seems important to know that these results come from women who 1) read Redbook, and 2) self-volunteered to respond from the questionnaire in Redbook. This makes the results highly non-representative of all women, and likely extremely biased

Election outcomes and predictions.

Selection of specific cereal or food at super-market.

3. Please make any other comments about this concept which you think are important for us to know.

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Social Science SOCIOLOGY

Quantitative Concept Descriptive Statistics

1. What is it that secondary students should know about this quantitative concept?

This is both a concept students should know and a skill that is basic in a highly technical society. Students should have the basic skills of math, numbers, and quantitative tools that describe data at hand. Concepts that may be used for a separate module or categorized into a more general module (such as descriptive statistics) might include: percentages, rates, mode (including unimodal, bimodal and multimodal), median, mean, frequency distributions, dispersion or variation, range and standard deviation.

2. Give an example of how knowledge of this concept is directly relevant to students' lives?

- exam scores, percentiles, mode, median range, deviation
- batting averages, yards gained per carry, points scored per game
- weights and volume in nearly any food item for purchase
- changes in frequency and rate of marriage, family size, divorce, remarriage and the like
- comparison of nearly anything from youth who graduate from high school in China vs. the U.S. to life expectancy of males vs. females

3. Please make any other comments about this concept which you think are important for us to know.

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Quantitative Concept Inferential Statistics

1. What is it that secondary students should know about this quantitative concept?

As with sampling, students should know that the problem of inference is to say something about a population or category based on a partial sampling or observation. This concept can be linked in with probability but is basic and important enough to exist separately. Whereas descriptive statistics (discussed separately) determine characteristics of the data at hand, inferential statistics estimate characteristics of a larger population from which the sample was drawn. Other related concepts might be or include estimation, confidence limits, hypothesis testing, including use of the null hypothesis, prediction, correlation, Chi-square, analysis of variance or other specific statistical tests.

2. Give an example of how knowledge of this concept is directly relevant to students' lives?

The logic of inferential statistics gives us a basis for making inferential leaps from samples to populations. Thus in making sense out of our own or others behavior and in understanding or in predicting it, this concept becomes extremely important.

Ex's testing relationships between: income and education
marital adjustment and presence of children
race and I.Q.
religion and abortion

3. Please make any other comments about this concept which you think are important for us to know.

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Social Science SOCIOLOGY

Quantitative Concept Levels of Measurement

1. What is it that secondary students should know about this quantitative concept?

These concepts may be a bit advanced for many secondary students but if statistical testing and significance levels are used, it becomes important to deal with variables such as nominal, ordinal, interval and ratio and specific statistical measures of association (Gamma, Lambda, Pearsonian Product Moment Correlation Coefficient, Rank order Correlation, etc.).

Nominal variables (marital status, group membership, etc.) are exhaustive and mutually exclusive. Ordinal variables (Grades, social class, attitude scale scores) are ranked in a described way. Interval and at times ratio variables have a standard unit of measurement and, if ratio, have a defined origin or zero point. Thus it seems to teach correlation requires an awareness of various levels of measurement.

2. Give an example of how knowledge of this concept is directly relevant to students' lives?

Useful in determining level of significance between two or more variables.

3. Please make any other comments about this concept which you think are important for us to know.

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Social Science SOCIOLOGY

Quantitative Concept BASIC MATH SKILLS

1. What is it that secondary students should know about this quantitative concept?

In our highly industrialized and technological oriented society basic math skills are essential (see concept listed as descriptive statistics. Students should be able to compute percentages, know and understand the difference between a mean, mode, and median, formulate a frequency distribution, and understand range, dispersion, and standard deviation to mention selected examples.

2. Give an example of how knowledge of this concept is directly relevant to students' lives?

In shopping:	Is it a better value to pay 89c for 14 ounces or $2.00 for 2 pounds?
In sports:	Valuable for computing and understanding earned run average, yards per carry, etc.
In automobiles:	miles per gallon, time from 0-60 mph.
In school:	grades, exam scores, cost of food, expense of football relative to paid attendance at games.
In work.	If I'm paid $2.75 per hour, is it economically profitable after paying for a baby sitter, transportation, taxes, etc.?

3. Please make any other comments about this concept which you think are important for us to know.

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QUESST Project

Social Science SOCIOLOGY

Quantitative Skill Graph Construction and Interpretation

1. What is it that secondary students should be able to do in relation to this skill?

One way to make data, statistics or distributions more clearly understood is to present them in graphic form. Students should be able to construct, understand and interpret things such as a histogram, polygon, and line graph. Other useful specialized graphic techniques might incluee population pyramids, pie charts, statistical maps, scatter plots, bar charts and the like.

2. Give an example of how a student would use this skill in his or her everyday life.

These graphic skills are very useful in visually noting or comparing:

- percent age 65 & over by state (statistical map)
- population distribution by age and sex in different countries (population pyramid)
- number of persons per household (Histogram)
- trends and changes in stock market (line graph)
- age distribution of a population (polygon)
- sources of expenditure of national budget (pie chart)
- residential density of a given city by census tract (scattergram)

3. Please make any other comments about this skill which you think are important for us to know.

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Quantitative Skill Table Construction and Interpretation

1. What is it that secondary students should be able to do in relation to this skill?

Students should know how to construct as well as interpretate cross-classification tables. These are very useful data reduction techniques as well as concise and vivid representations of multiple relationships.

In construction of tables students might be asked to take raw data (Ex: test scores by sex), census data or any secondary data and group or categorize these scores, establish rows and columns insert cell frequencies in cells, figure percentages of each cell, and interpret the results.

This skill should include giving the table a title, column headings and indicating the source of the data.

2. Give an example of how a student would use this skill in his or her everyday life.

This skill is useful in:

- reading the rankings of athletic teams by won-lost record
- reducing any data to a meaningful form
    - racial composition by school district
    - teacher composition by age and sex
    - education levels by occupational category
    - political preference by social class
    - divorce rates by age at marriage

3. Please make any other comments about this skill which you think are important for us to know.

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QUESST Project

Social Science SOCIOLOGY

Quantitative Skill Interviewing Techniques

1. What is it that secondary students should be able to do in relation to this skill?

This is a skill that has general applicability beyond the research arena. There is a real skill in asking the right questions (in unstructured situations), in establishing rapport with the interviewee, in insightful listening, in reporting what is said and meant and avoiding personal or circumstantial input, in probing, in remaining alert to sensitive, highly emotional areas, in using science constructively, in moving ahead to more productive areas when useful data no longer emerges, in getting valid information (measuring what you want to measure) and in getting reliable information (would you or another get the same results another time).

2. Give an example of how a student would use this skill in his or her everyday life.

This skill is useful in everyday interpersonal interaction, in classroom situations, in meeting strangers, in drawing out information from teachers, friends, parents, in business transactions and particularly in survey and social research where interviews are the source of data.

3. Please make any other comments about this skill which you think are important for us to know.

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QUESST Project

Social Science SOCIOLOGY

Quantitative Skill Locating social type data

1. What is it that secondary students should be able to do in relation to this skill?

Students should be aware of and know how to locate data. The mailed questionnaire and interview schedule are frequent sources of data. But there are many sources and methods available. Note for example the possibility of participant observation, case studies, public and/or private records, newspaper and magazine sources for content analysis, census material, simulation activities, library research, experimental techniques, use of camera or tape recording equipment, television broadcasts, company sales receipts or annual reports, personal documents and the like.

2. Give an example of how a student would use this skill in his or her everyday life.

Depending on what the student wants to know would partially dictate the source of data. But much information is already gathered for us. We need to be alert to various data sources.

3. Please make any other comments about this skill which you think are important for us to know.

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ATTACHMENT #4

Dr. LARSEN'S SYNTHESIS REPORT

ATTACHMENT #4

VANDERBILT UNIVERSITY
NASHVILLE, TENNESSEE 37235
TELEPHONE (615) 322-7311
Department of Mathematics • Direct phone 322-6672

Dec. 26

Douglas P. Superka
Staff Associate, QUESST
Educational Resources Center
855 Broadway
Boulder, Colorado

Dear Doug:

I'm sorry this is a little late, but between finals and a bad case of the flu, my work schedule has taken a pretty good beating. I have read several times the packet you sent me as well as the agenda for the January meeting. My perception of what you want may not be entirely on target but I hope that I am at least in the ballpark. One thing is abundantly clear: your consultants are not wanting for ideas. It would appear that a major part of your problem will be one of focus. What I will try to do here is indicate how I, as a statistician, might organize this material in trying to teach it.

From my vantage point, I can discern at least four distinct conceptual modules emerging from this material: one dealing with basic descriptive statistics, another with the investigation of relationships, a third with the rudiments of inference, and a fourth with the elementary notions of survey sampling. How these conceptual modules would be eventually translated into teaching modules would depend, I imagine, on the level of the students, the length of the course, and so on.

Module #1: Basic descriptive statistics

A. Summarizing and displaying a simple random sample

1. levels of measurement
2. tables (frequency distributions)
3. graphical representation of frequency distributions (histograms, frequency polygons)
4. measures of central tendency (mean, median); measures of variability (standard deviation)

B. Special techniques

1. index numbers
2. graphs showing percent change (semilog paper)
3. Venn diagrams, decision trees
4. interpretation of "specialty" graphs (population pyramids, supply and demand curves, etc.)

Comments

Descriptive statistics in some form or another ranked very high on everyone's list of important skills and concepts. This first module, as I envision it, would be primarily concerned with the techniques of tabulating, graphing, and so on, although it would not be too early to at least indicate the sorts of inference-type questions that data invariably suggest.

The success of a module such as this depends strongly on the quality of the data used to illustrate the methodology. It is absolutely essential that exercises involving, say, the construction of a histogram be based on 1) real data and 2) data having intrinsic interest to the student. This is one place your consultants should play a major role: have them supply you with as many sets of interesting data as they can.

One final comment should be made regarding the last item listed under Part B. It is my opinion that the usual development of descriptive statistics allocates too much time to the *making* of graphs and too little time to their interpretation. A valuable part of a module such as this would be to show a student, say, a population pyramid and get him to reconstruct the country's recent history--its involvement in a major war, its high birth rate, etc. In general, we should approach descriptive statistics as we would a foreign language, requiring a student to "translate" in both directions.

Module #2: Investigating relationships

A. Quantitative data

1. scatterdiagrams
2. correlation vs. causality
3. curve fitting (least squares line; Lorenz curve)

B. Qualitative data

1. cross-tabulations (contingency tables)
2. data reduction

Comments

Like Module #1, Module #2 deals with a topic that was frequently mentioned, although in a variety of terms. As I read through the consultants' comments, I noticed that the phrase "functional relationship" was used over and over again and yet no one said anything about finding a least squares line. For the higher grade levels, I would think that one could make an attempt at explaining the least squares criterion and developing the formulas for fitting a straight line. Here again, the choice of data sets is critical, particularly when addressing the correlation vs. causality question.

The transition from descriptive statistics to inference is always an awkward one, involving a number of concepts (sample vs. population, parameter vs. statistic) that students find particularly difficult to grasp. It may be the case, though, that the context within which this transition can be made most readily is the χ^2 test as it applies to contingency tables. If this is true, then the final part of Module #2 would provide a very natural lead-in to Module #3.

Module #3: Principles of inference

A. Basics

1. definitions, concept of null and alternative hypotheses, decision rules
2. application of the notion of statistical significance to the interpretation of contingency tables

B. Other applications of inference

1. estimation
2. analysis of binomial data

Comments

This is the general area of statistics whose importance the consultants seemed in least agreement about. The basic problem to consider would be the mathematical level of the students and the amount of time available for developing and motivating the theory. Personally, I don't feel that this material could be overemphasized. The concept of significance testing is so pervasive in the applied sciences that it really is a language in its own right. At the college level, I think it is, by far, the single most important topic in an introductory statistics course.

Module #4: Sampling

A. Survey sampling

1. simple random sampling
2. stratified random sampling

B. Special applications

1. Nielsen ratings, Gallup polls, marketing reserach, etc.
2. simulation studies

Comments

If I were to single out the "most neglected" area of statistics in college teaching, this would be it. The vast majority of introductory statistics books don't even mention survey sampling.

This would be a good module to use for student projects. Having a class actually carry out a survey from start to finish can be a most effective means of introducing students to the nitty-gritty of statistics--writing questions that cannot be misinterpreted, dealing with incomplete returns, setting up procedures for callbacks, etc.

I hope these comments will lend at least a little guidance to the problem at hand. I have chosen to defer making any comments about certain of the more philosophical points raised by your consultants--for example, the distinction between deductive and inductive reasoning, and between probabilistic science and deterministic science. I have no ideas at all on how those notions might be taught in a classroom. I have also omitted any mention of some of the more specialized topics such as cost-benefit analysis, the theory of elasticity, and so on. These will have to be fit into the more general framework by those who know more about them.

I am looking forward to meeting you in January. I have been able to confirm reservations on the return flights you recommended but I will be arriving in Denver at 5:25 (Jan. 8) on Frontier Flight #29, rather than on Frontier Flight #17. I will be certain to be by Door #5 no later than 7:30.

Best regards,

Richard J. Larsen
Assoc. Prof.

SED-77-18598

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ATTACHMENT #5

QUANTITATIVE CONCEPTS: A STRUCTURE

QUANTITATIVE CONCEPTS:
A STRUCTURE

A. DESCRIPTIVE STATISTICS

*1. Proportion

  a. General
  b. Percent
  c. Ratio
  d. Scaling
  e. Index Numbers

*2. Measurement

  a. Levels of Measurement - Nominal, Ordinal, Interval, Ratio
  b. Counting, Measuring and Eyeballing (Approximation)
  c. Errors in Measurement
  d. Variables - what they are

*3. Central Tendency (Location)

  a. General
  b. Mean
  c. Median
  d. Mode

4. Variability (Dispersion)

  *a. General
  *b. Standard Deviation (Average Deviation)
  c. Variance
  d. Skewness
  e. Lorenz Curve (inequality)
  f. Other (*range, quartiles, percentiles)

*5. Types of Graphs and Data Displays

  a. Pie Graph
  b. Bar Graph
  c. Line Graph
  d. Figure Graph
  e. Statistical Map (e.g, Density map)
  f. Population Pyramid
  g. Other

---

* The staff suggests that the project curriculum development efforts focus mainly on these concepts.

A. DESCRIPTIVE STATISTICS (con't)

6. Distributions (univariate/ 1 Variable)

   *a. General (Common types of Distributions)
   *b. Grouping Data, Histograms
   *c. Symmetric and Skewed Distributions
   d. Cumulative Distributions (ogives)
   e. Special Distributions - Binominal, Normal
   f. Continuous and Discrete Distribution

7. Bivariate Displays (two variables)

   *a. 2X2 or 2XN contingency tables (cross-tabulation)
   b. Criss-cross diagrams
   *c. Scatter diagrams (plots)

8. *Coordinate Systems

   a. Location, Distance
   b. Rectangular Coordinates
   c. Longitude and Latitude on the surface of earth
   d. Other

B. INFERENTIAL STATISTICS

1. *Probability and Chance

   a. General
   b. Techniques of computing probability
   c. Expectation or expected value

2. Sampling

   *a. Sample and population
   *b. Characteristics of Sample - randomness, size, representativeness
   *c. Sample Bias/ Random Error
   d. Other types of sampling (e.g., stratified)

B. INFERENTIAL STATISTICS (con't)

3. *Prediction and Estimation (Forecasts)
    - a. General
    - b. Interpolation and Extrapolation

4. Hypothesis Testing
    - a. Significance of results (difference between sample means - T test)
    - b. Other

C. FUNCTIONAL RELATIONSHIPS

1. *Associations
    - a. General Idea
    - b. Strength of, Direction of

2. *Variables
    - a. Causality
    - b. Independent Variables, Dependent Variables
    - c. Dimensionality
    - d. Relevant variables

3. *Linear and non-linear Relationships
    - a. Linear Increasing, Linear decreasing
    - b. Exponential Increasing, exponential decreasing
    - c. Combination curves - first increase, then decrease, or first decrease, then increase

4. *Correlation and Regression
    - a. Correlation } General Idea
    - b. Regression }

5. Mutivariate Relationships
    - a. Joint effects, interactions, partial effects
    - b. Iso quants (contour lines)

C. FUNCTIONAL RELATIONSHIPS (con't)

6. *Choice and Decision Making

a. Use of trade-off's
b. Conflict Resolution
c. Benefit-Cost Analysis
d. Values Clarification
e. Other (types of Decision-Making Models)

D. SCIENCE

1. Models

a. Types of Models, Probabilitic and Deterministic
b. Dominant Factors, neglibile effects
c. Propositions, Hypothesis
d. Simplifying Assumptions
e. Information Loss
f. Data Reduction
g. Role of Theory
h. Systems Relationships

2. Research Design/ Methodology

*a. Deciding on Data you want } limitation of data
*b. Where to look for data }
c. Operationalization of Concepts
d. Experimental Design
e. Validity and Reliability
f. Side effects / unintended impacts
g. Control variables

3. Types of Evidence

a. Qualitative and Quantitative
b. Degrees of "Proof"
c. Surveys, Questionnaires
d. Introspection
e. (Field) observation
f. Tests
g. Projective Methods

D. SCIENCE (con't)

4. Reasoning in Science

*a. Deduction and Induction
*b. Intuition
c. Direct and Indirect Reasoning
d. Detection of Logical Fallacies
e. Logic and Languages
f. Symbolism in Logic

MISCELLANEOUS

1. Average Response
2. Percent Change
3. Forecasts
4. Structure
5. Logical Possibilities
6. Randomizing effect
7. Domain (component)
8. Equilibrium
9. Simulation
10. Networks
11. Variation
12. Covariation
13. Pattern
14. Developmental Function
15. Stock and Flows
16. Present Discounted Value
17. Spatial Distribution
18. Spatial Interaction
19. Spatial Relationships
20. Flow (geographical term)

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ATTACHMENT #6

QUESST TEACHERS INTERVIEW SCHEDULE

ATTACHMENT #6

QUESST TEACHER INTERVIEW SCHEDULE

NAME ____________________ DATE ____________

SCHOOL ____________________ NO. of YRS. EXP. ____________

DISTRICT ____________________

SUBJECTS and GRADE LEVELS
(currently teaching) ____________________

____

____

____

____

The purpose of our QUESST project is to develop and field test 30-40 (1-3 days) activities in various social studies topics which can be inserted into existing courses and which use basic quantitative methods (mean and median, graphs and charts, percent and proportion.)

We would like your help in identifying some social studies topics that we should focus on in our project. Please comment on the following suggested list of topics. Add any others for which you would like to see an activity developed.

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A. POSSIBLE SOCIAL STUDIES TOPICS

I. Social Institutions

A. The Family
B. Community Issues
C. The School
D. Social Mapping
E.
F.

II. Political Institutions

A. Political Parties
B. Elections/Voting
C. Political Power/Decision-Making
D. Governmental Power
E.
F.

III. Economic Institutions

A. Employment Patterns
B. Quality of Life
C. Growth/Inflation
D. Decision-Making/Trade-offs
E.
F.

POSSIBLE SOCIAL STUDIES TOPICS

IV. Life Coping/Consumerism

- A. Advertizing
- B. Credit/Insurance
- C. Employment
- D. Comparative Purchasing
- E. Taxes
- F.
- G.

V. World History

- A. Quality of Life
- B. Multinational Corporations
- C. European Reconstruction
- D. Pre-W.W. II Inflation
- E.
- F.
- G.
- H.

VI. U.S. History

- A. Foreign Aid
- B. Depression
- C. Slavery
- D. Immigration
- E. Ethnic Groups
- F.
- G.
- H.
- I.

POSSIBLE SOCIAL STUDIES TOPICS

VII. Population

A. Migration (economic, political, religious)
B. Growth
C. Distribution
D.
E.

VIII. Communication

A. Advertizing
B. Cross-cultural
C. Values
D.
E.

IX. Quality of Life

A. Environment
B. Energy
C. Sports
D. Health/medicine
E. Income
F. Decision-making
G. Crime
H.
I.
J.

General Comments:

B. REACT [redacted] PROJECT

I. Complete the statement: "If you want me to use these activities in my classes make sure they:

A.
B.
C.
D.
E.
F.
G.

II. How would your students react to such activities?

III. Have you taken any math or statistical courses in College? If so, how did you like them? If not, what is your general attitude toward math and statistics?

IV. Do you teach any quantitative concepts in your courses? If so, which ones?

V. Would you think it important for secondary students to learn about some basic quantitative concepts in social studies? Explain (why are why not? How important?)

VI. Do you have any lessons or activities you would share with us to give us an idea of the kinds of things you do (not necessarily quantitative)?

VII. Any other comments about the project? (e.g., What problems do you see us encountering in this project)?

C. FIELD TEST TEACHERS

I. Would you like to be one of our field test teachers?

II. If so, which courses (i.e., classes) would you prefer we worked in?

III. What types of students are in these classes? (e.g., above average, average, below average - academically).

ATTACHMENT #7

TEACHERS AND SCHOOLS:

SPRING - 1978 - BENCHTEST

1. Denver Public School 837-1000
900 Grant St.
Denver, Colorado 80203

*Loyal Darr, Social Science Supervisor
18 Social Science Coordinators - Junior High

2. Cherry Creek Schools - Sr. High 773-1184
9300 East Union Avenue
Denver, Colorado 80237

*Jim Stamper, Social Studies Coordinator, U.S. History, Sociology
Jerry Jordon, Psychology, U.S. History
Allene McCall, American History, Sociology
Maury Lane, American History, Sociology
Jim Hinton, Anthropology, Psychology, Sociology
Don Jacoby, Economics

3. Platt Valley Schools - Jr. & Sr. High 303/352-6168
P.O. Box 487
Kersey, Colorado 80644

*Don Miller, Social Studies Coordinator, U.S. History, Colorado History
Charlene Tamayo, Geography
Jim Carrier, World Cultures, Social Studies, Colorado History
Ms. Beatrice, World Cultures, Social Studies
Ranita Left, Economics, Humanities

4. Boulder Schools - Platt Jr. High 499-6800
6096 Baseline Road
Boulder, Colorado 80302

*Joanne Reno, Government
Jean McGinnis, Geography, American History, World Cultures
Linda Rehm, Geography, American History
Keith Heslip, Geography
Marany Reed, American History

5. Boulder High 442-2430
1604 Arapahoe Avenue
Boulder, Colorado 80302

Dave Axelson, Economics
*Fay Metcalf, American Studies, Anthropology, Local History
Tom Shaw, American Studies, American Indian and Applied Social Sciences
Tony McGuiness, American History/Studies, American West
Shirley Ward, Psychology, World History

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ATTACHMENT #8

QUANTITATIVE CONCEPTS

ATTACHMENT #8

QUANTITATIVE CONCEPTS:

The Basic List

1. NUMBERS permeate our lives. From a brief glance at the numerous descriptive "code numbers" that have been assigned to us as individuals or group members, it is evident that numerical literacy is necessary for effective living. In addition to being provided with an understanding of these roles of numbers and their strengths and weaknesses, students should be encouraged to learn for themselves where "numerical data" are to be found by a consideration of the two questions: a) What do I want to find out? and b) How do I go about finding it? These broad questions underlie personal as well as scientific investigations, using qualitative as well as quantitative data. They reflect important skills which students need to appreciate and understand.

(For the special problems involved in understanding numerical information when presented in the form of percentages see #2. For the problems involved in locating and analyzing information when presented in the highly compact visual forms of tabular and graphical displays see #'s 7 and 8. For the natural continuations to questions a and b above, see #10).

2. PERCENTS, RATIOS, AND INDEX NUMBERS are the main tools needed to make meaningful comparisons of numerical data when the bases are not the same. In many of these (very common) situations it is necessary first to convert the raw numbers to a ratio (fraction), percentage, or index number (decimal). Sometimes, or course, raw numbers are more appropriate than percentages. For example: a one-dollar savings on a ten-dollar purchase may be more critical than a $15 dollar savings on a $100 purchase even though the first is only a 10% discount, while the second is 15%. Similarly in polling, 1 out of 3 choosing a certain product may only represent 3 persons responses. In this case, a figure of 33 1/3% might be misleading.

All these representations (percent, ratios, index number) are traditionally taught in mathematics classes. Presenting all three forms as illustrative of social science topics is quite useful. Confirmation of this can be obtained by scanning almost any newspaper page, where not only are all three forms used, but they are invariably given as an integral part of the verbal descriptions. That is, familiarity with percents, index numbers and ratios is rapidly becoming a basic reading skill. (For the special treatment of those ratios that represent "averages" see #9).

3. CLASSIFICATION, or organizing data into groups or categories of any sort, is a basic human ability. From children sorting blocks to scientists making and using complex taxonomies, we can find infinitely many illustrations. We can group persons or conditions in innumerable ways. The advantages of using numbers to describe these groups is that once so grouped, the members of each class can be tallied. After classification, comparison or other analysis -- whether in terms of the basic numbers themselves or of percentages -- can be profitably undertaken. By bringing the ability to classify into conscious focus, it will be possible to point out the pitfalls of stereotyping and caricaturizing (distortions of the valid purposes of classifying) and emphasize, rather, the more positive benefits of classification: ease of recording information, ease of recall, ease of spotting relationships.

4. RANK-ORDERING is perhaps one of the concepts that has strongest connections to everyday life and usage. Expressions such as "What number from 1 to 10 best expresses or describes ......" abound. As well as in informal conversation, scaling situations occur frequently when taking surveys and when summarizing survey information (See #10). In terms of its relationship to the preceding major idea (#3, classification), rank-ordering or scaling occurs whenever the objects classified can form an ordered sequence. (Note that as well as rank-ordering objects already classified, the process of setting up a rank-order scale can aid in deciding on forming classification intervals). We indicate these situations by use of the words, "greatest number to least number" (for demographic data), or, if in a scale of choices, "most desirable to least desirable," etc. As with other quantitative concepts in our basic list, pointing out the possibility of misuse and dangers of inappropriate use will be part of instructional objectives.

5. COMPARING CLASSIFICATIONS arises since, as a general principle, it can be stated that whenever something can be classified in one way, it can also be classified in another way. If we are comparing wages for workers based on a classification by sex, we can reclassify and compare again by race. If we are looking at data on "families," we can choose to study one family over time or study a few families at one point in time. Closer to home, students could look at their time allocations over a week's time by either day or type of activity. Sometimes, when we have two (or more) ways of categorizing or grouping, as in our first example above, we can make a contingency table to show the number of possible groups arising from such a double (or multiple) classification. In general, as well as facilitating the skills of making classification systems, it is equally important to give students the skills of flexibility in being able to re-organize categories to suit the problem at hand.

6. A ONE-DIMENSIONAL CONTINUUM arises whenever numerical data can be pictured as a segment on a straight line. An example from psychology is introversion and extroversion. People are usually neither completely introverted nor extroverted, but can be better described by degree of introversion (or extroversion). Information on much human behavior and the description of many economic/political/social conditions cannot be expressed in an either-or manner but requires instead a "continuum of values." Later on, #10 deals more fully with research methods, including the concept of isolating significant variables, each of which constitutes "one dimension" of a problem. But even at this stage, we can talk about "factors" in personal and social life, emphasizing the key notion of the range of possible values these variables or factors measure. (Note that the concept of range is also used in connection with a rank-ordered scale - #4). Another point to be emphasized at this stage, even if by just raising the question, is this: "Does an indicator whose range of values forms a one-dimensional continuum truly measure what it is supposed to?"

7. READING LISTS AND TABLES is also fast becoming a necessary reading skill. As such, it is the logical extension of reading statements about particular numerical facts when expressed as numbers or percents. In the same way

as with the latter, the usual way of avoiding reading problems connected with tables (and this applies to graphs, #8 below, as well) is to skip them entirely. This is a pity, because a list or table (compound list with several columns) is a concise and efficient way of presenting much information on a topic. Whether the columns of a table present numbers (absolute magnitudes) or percents (relative magnitudes), the method of presentation allows rapid comparisons of data provided the abilities of visual search are known. Techniques for reading tables can be conveniently broken into four major groups: (1) searching for specifics, (2) searching for maximums and minimums, (3) calculating ranges (see #6) and (4) calculating averages (see #9 for the problem of averages in its more general context).

8. READING GRAPHS entails all the steps named above for the reading of tables. All comments given there apply here. In particular, the four stages of searching for specifics, looking for maximums and minimums, calculating the range and estimating or computing averages carry over here Again, the main idea we wish to convey is that a graph is a useful way of presenting information in a perhaps unfamiliar, but when understood, visually appealing form. Basic types of graphs are the Bar Graph, the Circle Graph, and the Line Graph. All types are encountered frequently in newspapers, magazines, and books. An understanding of the kinds of reasoning used for interpreting graphs is quite essential to numerical literacy or "numeracy". As well as teaching the specific graphic forms listed, we will show the comparative uses of each type of graph as well as compare the uses of graphs and tables.

9. AVERAGE (OR CENTRAL TENDENCY) is another concept that is found frequently in the media as well as in popular expression. Using this basis of familiarity, it can be shown how the idea of an average can be specified in three distinct ways (each with advantages and disadvantages) -- the mean, the median and the mode -- and how these ideas can be applied in many different situations within the social studies. Finding averages has been mentioned above in connection with the reading of tables and graphs. Even more basically than this, averages occur most simply whenever information of an extensive sort - from rainfall to income - can be most conveniently expressed and understood as a ratio. Whenever a quantity is distributed over-space (e.g., population density) or over a population (GNP per capita) the concept of average is

useful. Additionally, topics that employ time-rates or space rates in their descriptions give a valuable introduction to the student of what is perhaps one of the most profound and important ideas in the growth of western civilization - that change itself can be quantified and consequently understood and perhaps even mastered in many situations.

10. RESEARCH METHODS fall into several classes. Some of these are: conducting surveys, designing an experiment, and doing a full scale library search. After data have been found (See #1 - NUMBERS - for the first two stages of data searching; deciding what information to look for and locating it) some type of data organization and the drawing of accurate conclusions is usually done. An informed public needs to have some ideas of the methods researchers use in these processes. The use of tables and graphs is basic to an understanding of organization of data and to research methods of all kinds. Drawing conclusions hinges on the notions of generalizability and the limitations of data. Two basic questions that students should learn to ask are: "Do we have enough data?" and "Is the data we have good enough?" Some continuations to these ideas might possibly be taught to able students. At the other pole, research methods can and should be seen as extensions of everyday methods of procuring information. A library search extends casual reading, taking a poll extends informal non-structured interviewing, while conducting an experiment extends the daily process of purposeful observation. While it may be necessary, in order for students to gain a deeper appreciation of research methodology, to await further stages of their education (college), it is possible by presenting simple suitable examples of such research, to give a valuable introduction.

The following two quantitative concepts deserve somewhat different status for they can be introduced into the study of any of our Basic Concepts (#'s 1-10) and be found helpful in such a context. They are, in this sense, best describable as "flow-through" concepts. We feel both are quite important. The skills of estimating and figuring trade-offs are an important part of most every professional's abilities, and ought to be part of every citizen's lifeskills.

A. ESTIMATION AND APPROXIMATION can be contrasted with precise computing. In mathematics it is as important to have a feeling or intuition for whether a calculation is reasonable as to be able to know if it is exactly accurate. Conversely, it is an important ability to be able to approximate what a more exact figure should look like before computing it. Getting a feel for numbers, of course, usually comes only after much numerical practice in doing problems. It is hoped that we will be able to simultaneously develop skills in estimating as we develop some of the more exact techniques needed to work effectively with our basic quantitative concepts. For example, we can work with estimating percents or estimating the average points on a graph at the same time we give exact directions and practice in finding these.

B. TRADE-OFFS in the social sciences are tools of optimization and decision-making. At a more basic and prevalent level in everyday life, given that "the more of X the less of Y and we can't have them both" (the trade-off form of reasoning), we can ask, for one's optimal balance point. On both these levels, the trade-off pattern of reasoning occurs very often. At times, we use this thought pattern even though we may not be fully conscious of doing so. As with other tools, the more conscious the use, the better. That is, to recognize those situations in life where a trade-off type of argument is appropriate or being assumed in discussion is a good prelude to being able to work with such arguments on an exact numerical level later on in ones education, if one indeed goes into the sciences, while from the needs of the generally informed citizen, recognition is valuable enough in and of itself.

ATTACHMENT #9

INSTRUCTOR EVALUATION FORM

SED-77-18598

ATTACHMENT #9

INSTRUCTOR EVALUATION FORM

SCHOOL ____

INSTRUCTOR ____

LESSON USED ____

EVALUATION helps to insure that materials are relevant and usable. Your responses will be used to revise the lesson before dissemination. Thank you for your participation in testing and evaluating the lesson.

1. At which level and with which class was the lesson used?

   Grade level: ________________ Class: ____________________________

2. Was the lesson appropriate for that grade level? (Check one.)

   Yes _____ No _____ If No, why not?

   ____

   ____

3. Was the reading level appropriate for that grade level? (Check one.) Yes _____ No _____ If No, was the level (Check one.)

   Too high _____ Too low _____

4. Does the lesson fit into your current curriculum? (Check one.)

   Yes _____ No _____ If No, please explain why not.

   ____

   ____

5. How many students did the lesson? ______

6. What was the degree of student interest in the lesson? (Check one.)

Low _____ Average _____ High _____

7. Please identify any problems which you as a teacher encountered in using the lesson in your classroom:

Problems with directions: ______________________________
____

Problems with social studies content: ______________________
____
____

Problems with quantitative (math) content: __________________
____

8. What did you feel to be the strong points of the lesson?

____
____

9. What problems, if any, did your students encounter with the lesson?

____
____

10. What did your students enjoy most about the lesson?

____
____

11. What did your students learn from the lesson?

____

____

____

12. What changes, if any, would you make in the FORMAT of the lesson?

____

____

____

13. What changes, if any, would you suggest to improve the lesson? (procedures, discussion questions, student materials.)

____

____

____

____

14. Would you use the lesson again? (Check one.)

Yes ____ No ____ If No, why not?

____

____

SED-77-18598

ATTACHMENT #10

TOPICS, TITLES, AND CONCEPTS

ATTACHMENT #10

Project QUASST Modules

Topics, Titles, and Concepts

World Nations--Cluster I

1. COMPARING NATIONS: HEALTH AND WEALTH AROUND THE WORLD

   Social Studies Concepts: Health, wealth, and income.

   Quantitative Concepts: Number (indicators), rank order, range, and average (mean).

2. NATIONS: WHERE DO PEOPLE LIVE?

   Social Studies Concepts: Health, wealth, and urbanization.

   Quantitative Concepts: Correlation and scatter diagrams.

3. AROUND THE GLOBE: FREEDOM AND QUALITY OF LIFE

   Social Studies Concepts: Political freedom and quality of life.

   Quantitative Concepts: Numbers (index and indicator).

World Nations--Cluster II

1. WORLD POPULATION: GROWING, GROWING, GONE

   Social Studies Concepts: Population growth.

   Quantitative Concepts: Average (median), numbers and graphs (line).

2. GLOBAL INTERDEPENDENCE

   Social Studies Concepts: Global interdependence and global relationships.

   Quantitative Concepts: Indicators, estimation, tables, and graphs (line).

3. NATIONS: GUNS OR BUTTER?

   Social Studies Concepts: Public expenditures.

   Quantitative Concepts: Correlation, rank order, graphs (bar) and percent.

[illegible]

U.S. Population Trends--Cluster III

1. AMERICAN IMMIGRANTS

   Social Studies Concepts: Immigration patterns.

   Quantitative Concepts: Graphs (bar and circle) and percentage.

2. RURAL-URBAN MIGRATION

   Social Studies Concepts: Migration and population.

   Quantitative Concepts: Tables, graphs (bar and line), and percentage.

3. PROBLEMS: POPULATION DATA

   Social Studies Concepts: Population sub-groups, Spanish heritage persons, and discrimination.

   Quantitative Concepts: Tables and percentage.

4. WHERE PEOPLE ARE GOING

   Social Studies Concepts: Migration, population distribution, and effects of population change.

   Quantitative Concepts: Tables, average (median), and percent.

Economic Issues in the United States--Cluster IV

1. WHAT AMERICANS EARN

   Social Studies Concepts: Income and occupations.

   Quantitative Concepts: Average (mean and median) and tables.

2. INCOME - HIS AND HERS

   Social Studies Concepts: Income distribution and discrimination.

   Quantitative Concepts: Average (median), tables, and bar graphs.

3. RISING PRICES

   Social Studies Concepts: Consumer Price Index, changing prices, and inflation.

   Quantitative Concepts: Index numbers and percentage.

4. INCOME AND PRICES

   Social Studies Concepts: Income (per capita, personal disposable, and real), Consumer Price Index, inflation, and occupational groups.

Quantitative Concepts: Percent, tables, and line graphs.

Energy Issues--Cluster V

1. THE ENERGY CRUNCH AND THE NUMBERS GAME

   Social Studies Concepts: Population growth and limits of growth.

   Quantitative Concepts: Correlation and rates of change (exponential growth).

2. CONSUMING ENERGY: THE U.S. VS. THE WORLD

   Social Studies Concepts: Private vs. industrial energy consumption and economic inequality.

   Quantitative Concepts: Percentage and correlation.

3. ENERGY: HOW IMPORTANT IN MY LIFE?

   Social Studies Concepts: Energy consumption, economic and energy inequality necessities of life.

   Quantitative Concepts: Rank order, estimation, and percentage.

American Family and Consumer Issues--Cluster VI

1. WILL THE REAL AVERAGE AMERICAN FAMILY PLEASE STAND UP?

   Social Studies Concepts: Family, ethnic group, income, and occupation.

   Quantitative Concepts: Average (mean, median, and mode), range (variability) and sample.

2. THERE'S A SUCKER BORN EVERY MINUTE

   Social Studies Concepts: Mass advertising and representative sample.

   Quantitative Concepts: Percentage and limits of statistics (proper and improper usages).

3. BUT HOW DO I KNOW WHICH ONE TO BUY?

   Social Studies Concepts: Decision making, priorities, and consumer goods.

   Quantitative Concepts: Trade-offs, tables, and rank order.

American Lifestyle Changes--Cluster VII

1. THE AUTOMOBILE AND AMERICAN LIFESTYLE: 1910-1935

   Social Studies Concepts: Residency patterns, life style, and technology.

Quantitative Concepts: Graphs, tables, and percentage.

2. ADVANCES IN MEDICAL TECHNOLOGY AND CHANGING LIFESTYLES

   Social Studies Concepts: Medical technological change.

   Quantitative Concepts: Tables, graphs, and rank order.

3. WARFARE AND TECHNOLOGY

   Social Studies Concepts: Military technology and civilian industrial technology.

   Quantitative Concepts: Graphs, tables, and rank order.

American Government--Cluster VIII

1. 2/3 MAJORITY

   Social Studies Concepts: 2/3 majority vote and executive legislative relationships.

   Quantitative Concepts: Numbers and ratio.

2. GIVE THE PEOPLE WHAT THEY WANT

   Social Studies Concepts: Decision making and feedback.

   Quantitative Concepts: Survey methods and sampling.

3. THE GOVERNMENT DOLLAR

   Social Studies Concepts: Government income and expenditures, government growth, and the role of government.

   Quantitative Concepts: Graphs (circle) and tradeoffs.

4. DON'T LOOK NOW . . . BUT YOUR IMAGE IS SHOWING!

   Social Studies Concepts: Perception, image, and voting behavior.

   Quantitative Concepts: Measurement, tables, and correlation.

Quantitative Supplements

1. NUMBERS IN THE WORLD
2. READING A TABLE
3. READING A BAR GRAPH
4. READING A LINE GRAPH
5. READING A CIRCLE GRAPH
6. CONSTRUCTING AN INDEX

ATTACHMENT #11

PROJECT QUESST ARTICLES

ATTACHMENT #11

PROJECT QUESST: TEACHING A NEW BASIC IN SOCIAL STUDIES

by

Douglas P. Superka and Kenneth A. Switzer

Here is a quick quiz for you:

1. Which of the following nations has the highest average income (per capita GDP) in the world?

   ______ Sweden ______ Kuwait ______ U.S.A. ______ Switzerland

2. Of the four nations listed below, which has the lowest average income?

   ______ Sweden ______ Kuwait ______ U.S.A. ______ Switzerland

3. Which of the following nations is the healthiest in the world (based on life expectancy rates)?

   ______ Japan ______ U.S.A. ______ Canada ______ Sweden

4. Of the four nations listed below, which is the least healthy (i.e. has the shortest life expectancy rate)?

   ______ Japan ______ U.S.A. ______ Canada ______ Sweden

You might be surprised by the answers: 1) Kuwait has the highest average income - $8042; 2) U.S.A. has the lowest average income of the four countries - $6189; 3) Sweden has the longest life expectancy - 72.1 years for males and 77.5 years for females; 4) U.S.A. has the shortest life expectancy of the four countries - 68.2 years for males and 75.9 years for females. (This information was obtained from the Statistical Yearbook:1976 published by the United Nations).

This short quiz is the opening activity of a teaching module for a world cultures or geography course. The module is designed to help secondary students learn certain basic quantitative concepts while focusing on an important social studies topic. After an initial discussion of the answers to these questions, students are engaged in several activities which help them: identify the advantages and disadvantages of using a numerical measure (such as life expectancy or gross domestic product) as an indicator of a complex social reality (such as health or wealth);

read and interpret tables of data on life expectancy and average income for a sample of nations around the world; and explore the relationship between these two factors (e.g. Do nations with a high average income tend to have a long life expectancy or a short life expectancy? What are possible reasons for the observed trends?).

This teaching module is one of 40 modules being developed and fieldtested by the Educational Resources Center, associated with the Social Science Education Consortium in Boulder, Colorado. This two-year project, entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST), is funded by the National Science Foundation. Project QUESST is based on the belief that it is important for junior high and senior high school students to learn the value and limitation of employing quantitative data and methods in the study of social issues. Today, mathematical and statistical techniques are being used extensively in all the social sciences. Students considering a social science as a profession should be acquainted with the use of quantitative methods in secondary school. Moreover, these methods are becoming increasingly prevalent and important in everyday life. As citizens we make choices and decisions several times each day. Many of these decisions, whether or not we are aware of it, are based on inferences from samples in the form of manufacturers' claims for products, the results of consumer polls, the results of political polls, or the published results of scientific research. If the citizen truly desires to maintain the power to make decisions affecting his or her life, that citizen must know how to evaluate quantitative data and findings --when to believe them, when to question them, and when to reject them. Quantitative concepts are indeed becoming a "basic" in the social studies.

The 40 modules being developed by the QUESST staff are designed to be integrated into existing social studies courses--12 primarily for junior high school, 14 for senior high, and 14 which can be used with adaptations at both levels. The one tc three-day modules are to be used as periodic supplements to the basic textbook or normal program rather than as a basis for a new course. The modules consist of instructional objectives, detailed teaching procedures and questioning strategies, student handouts, and supplemental teacher information. Each module focuses on an important social studies topic and deals with one or more quantitative concepts. For example, "Comparing Nations: Health and Wealth Around the World," from which the above quiz was taken, is primarily a world cultures or geography lesson in which students compare nations in terms of two indicators of quality of life. Quantitative concepts developed in that module are average, rank order, numbers as indicators, and reading tables.

Other social studies topics to be covered in the QUESST modules are indicated by the following module titles: "Around the Globe: Freedom and Quality of Life," "World Population: Growing, Growing, Gone," "Global Interdependence," "American Immigrants," "Rural-Urban Migration," "What Americans Earn," "Income and Prices," "The Energy Crunch and the Numbers Game," "Will the Real Average American Family Please Stand Up," "The Automobile and American Lifestyle: 1910-1935," "Crime Patterns: U.S. and Japan," "Two-thirds Majority Vote," and "The T.V. Ratings Game." The quantitative concepts developed in the QUESST modules include: numbers as indicators, percents, ratio, rank order, reading tables and graphs, average (mean and median), range, estimation and approximation, correlation, sampling, and prediction. As the titles indicate, the modules cover most secondary social studies courses, including American history and government, World history and geography, economics, sociology, and current issues. Some modules are appropriate for inclusion in more than one course. "What Americans Earn," for example, could be used profitably in recent American history, economics, and sociology courses.

The QUESST modules will be field tested nationally during the 1978-79 school term. Self-report surveys will be used to determine student and teacher attitudes toward the modules and toward dealing with quantitative concepts in social studies. Student cognitive achievement will be assessed by pretests and posttests. The modules will be revised based on the field test results and published in final form in the fall of 1979.

Information about QUESST will be disseminated periodically during the 1978-79 school term through newsletters and at several professional conferences. For more information please write Project QUESST, 855 Broadway, Boulder, Colorado 80302.

SED-77-18598 ATTACHMENT #11.1

PROJECT QUESST: TEACHING A NEW BASIC IN SOCIAL STUDIES

by

Douglas P. Superka and Kenneth A. Switzer

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read and interpret tables of data on life expectancy and average income for a sample of nations around the world; and explore the relationship between these two factors (e.g. Do nations with a high average income tend to have a long life expectancy or a short life expectancy? What are possible reasons for the observed trends?).

This teaching module is one of 40 modules being developed and fieldtested by the Educational Resources Center, associated with the Social Science Education Consortium in Boulder, Colorado. This two-year project, entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST), is funded by the National Science Foundation. Project QUESST is based on the belief that it is important for junior high and senior high school students to learn the value and limitation of employing quantitative data and methods in the study of social issues. Today, mathematical and statistical techniques are being used extensively in all the social sciences. Students considering a social science as a profession should be acquainted with the use of quantitative methods in secondary school. Moreover, these methods are becoming increasingly prevalent and important in everyday life. As citizens we make choices and decisions several times each day. Many of these decisions, whether or not we are aware of it, are based on inferences from samples in the form of manufacturers' claims for products, the results of consumer polls, the results of political polls, or the published results of scientific research. If the citizen truly desires to maintain the power to make decisions affecting his or her life, that citizen must know how to evaluate quantitative data and findings --when to believe them, when to question them, and when to reject them. Quantitative concepts are indeed becoming a "basic" in the social studies.

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the Link

Volume 2, Number 4 March 1979

QUANTITATIVE UNDERSTANDING: A NEW BASIC

By Kenneth A. Switzer
Staff Associate, Project QUESST

Freedom and quality of life--to teach about these vital topics in a world cultures' class, where could you find appropriate data? What data could be used effectively as indicators of such complex and abstract concepts as freedom or quality of life? How could the data best be presented to students in a form that would allow useful comparison between nations?

America is a nation of immigrants. To study immigration patterns in a U.S. history course, what type of information would best indicate changing patterns of the numbers of immigrants flowing to this country and of the nations of origin of those immigrants? How could data best be presented that would facilitate ready comparison of immigration patterns at different points in time?

The use and understanding of quantitative concepts in the social studies classroom will allow students and teachers to answer these questions in a manner which enhances the learning process.

ENTER PROJECT QUESST

Under a grant from the National Science Foundation, the Educational Resources Center (an affiliate of the Social Science Education Consortium) is developing and field testing a series of one- to three-day learning modules. This two-year project, entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST), is based on the belief that it is important for secondary-level (grades 7-12) students to learn both the value and the limitations of employing quantitative data and methods in the study of social issues.

Students considering any social science as a profession should be made aware that quantitative, statistical techniques are employed extensively today by social scientists. Moreover, quantitative data of various kinds are prevalent in the daily lives of most Americans. As citizens in a democratic, free-enterprise society, we make decisions frequently. We may not always be aware of the fact that many of these decisions are based on inferences drawn from quantitative data presented in a variety of forms--the results of political polls and consumer surveys, manufacturers' claims for products, government reports, and the published results of scientific research. If we wish to retain the power to make informed decisions, we must be able to evaluate the quantitative data that we encounter daily. Quantitative concepts and skills are indeed basic in the social studies and to participatory citizenship in this country.

Project QUESST is developing 35 learning modules--12 primarily for junior high school, 13 primarily for senior high school, and 10 which can be used with adaptations at both levels. The quantitative concepts and skills treated in the project materials include indicators and index numbers; percent and ratio; rank order, range, and continuum; classification, tables, and contingency tables; bar graphs, circle graphs, and line graphs; measures of average, including mean, median, and mode; estimation and approximation; tradeoffs; research methods, such as surveys and sampling; association, correlation, and scatter diagrams; and probability.

WIDE RANGE OF DISCIPLINES

The Project QUESST modules are intended to be used as periodic supplements to basic texts and social studies programs rather than as bases for separate units or new courses. The modules developed by the project staff range across the secondary social science disciplines to cover American history and government, world history and geography, economics, sociology, and current social issues. Some modules are appropriate for inclusion in more than one course. "What Americans Earn," for example, could be used readily in courses covering current American history, economics, social issues, and sociology.

Each learning module focuses on an important social studies topic and introduces students to one or more quantitative concepts. For example, "American Immigrants" is primarily a U.S. history lesson in which students utilize graph-reading skills and percentage data to compare American immigration patterns across time. Each module is a complete, self-contained learning activity with the following components: a brief rationale, a list of appropriate courses, information about grade level and required teaching time, a list of social studies and quantitative concepts included in the module, a statement of instructional objectives, a list of data sources, detailed suggestions for classroom teaching procedures, all necessary student materials, teacher answer sheets or supplemental information sheets as required, a module summary, and suggestions for extension activities.

SURPRISES FOR STUDENTS

"Comparing Nations: Health and Wealth Around the World" is an example of a module designed for inclusion in a world cultures or geography course. The module's opening activity is a short quiz that confronts students with discrepant data. The quiz, for example, asks:

1. Which of the following nations has the highest average income (per-capita GDP) in the world?

_____Sweden
_____Kuwait
_____U.S.A.
_____Switzerland

2. Of the four nations listed below, which has the lowest average income?

_____Sweden
_____Kuwait
_____U.S.A.
_____Switzerland

3. Which of the following nations is the healthiest in the world (based on life-expectancy rates)?

_____Japan
_____U.S.A.
_____Canada
_____Sweden

4. Of the four nations listed below, which is the least healthy (i.e., has the shortest life-expectancy rate)?

_____Japan
_____U.S.A.
_____Canada
_____Sweden

Students are often surprised by the answers: (1) Kuwait has the highest average income--$8,042; (2) the U.S.A. has the lowest average income of the four countries--$6,189; (3) Sweden has the longest life expectancy--72.1 years for males and 77.5 years for females; (4) the U.S.A. has the shortest life expectancy of the four countries--68.2 years for males and 75.9 years females. (This information was obtained from STATISTICAL YEARBOOK: 1976, published by the United Nations.)

After an initial discussion focused on this opening activity, students are presented with data on health and wealth around the globe. The quantitative term indicator is defined; life expectancy is identified as the selected indicator of health, while average per-capita income is identified as the selected indicator of wealth. For each major global geographic region--e.g., Africa, Asia, Europe--both the high and the low nation of the region for each indicator (health and wealth) is presented.

RANKING THE NATIONS

Working in small groups, students place these nations in rank order from high to low and calculate the range of an indicator in each region. For example, the range for wealth in Europe is the difference between the average incomes of $6,387 in Switzerland and $1,811 in Greece--a range of $4,576.

Placing data in rank order, students discover, is an important step toward accurate description and comparison of nations and geographic regions. Calculating ranges also facilitates description and comparison. With these data at hand, students may explore relationships between the two indicators as well as relationships between the indicators and other organizing concepts, among them developed/developing, modern/modernizing, and first/second/third-world nation.

Last--and this phase is vitally important--students are introduced to a discussion of the limitations of data and data use. For example, students learn that literacy rate is a commonly used indicator of modernization or development. However, as the term is reported and utilized by the United Nations, literacy in one nation may mean nothing more than the ability to sign one's name, whereas literacy in another nation may be defined as the ability to read, understand, and respond in writing to a written paragraph of complex material.

ANN WILLIAMS, EDITOR; CYNTHIA OCKEN, PRODUCTION

Subscriptions to The Link are $5.00/year for U.S. residents and $7.00/year for foreign residents. Subscriptions must be accompanied by check, money order, or institutional purchase order. Send correspondence or subscription to SSEC, 855 Broadway, Boulder, Colorado 80302.

"Give the People What They Want" is a module designed primarily for use in an American government course, though it could be easily incorporated into a sociology or social issues course. This module raises two basic questions: How do local-government officials know what their constituents want? How can government decision makers systematically obtain citizens' views on current issues?

In the opening activity of this module, students role-play five city council members who must make decisions about the city's recreation budget. Each council member is given one piece of information on which to base an initial decision.

The role play raises a number of questions: How were the council members' decisions influenced by the information that they had received? Which kind of information might have had the greatest impact on the decisions reached? In what way is each piece of information biased? If obtaining the views of citizens is important, what techniques might be used to obtain reliable citizen input on issues?

Discussion of a six-step outline of the decision-making process helps students become aware that citizen input can be valuable at all stages of the process, from identifying problems or issues to judging the effectiveness of actions taken to resolve problems.

The suggestion that a survey of citizens' opinions might be conducted--which is almost always advanced during class discussion at this point--leads to the next step in the lesson: a card-sort activity in which students organize seven separate steps in the survey process in logical order, from identifying the topic to be surveyed to analyzing and interpreting survey results.

The concluding activity of this module presents students with a survey questionnaire based on the recreation issue facing the city council in the role-play activity. After reviewing and critiquing the questionnaire, students develop and conduct a local or school survey to answer a question or address an issue of their own choosing.

ABOUT THE QUESST STAFF

The Project QUESST staff members are all former classroom teachers in the social studies. Their combined teaching experience encompasses elementary, secondary, collegiate, and inservice teaching in a variety of states--among them Pennsylvania, Colorado, Minnesota, and California--as well as in Korea and Colombia.

The Project QUESST materials are being field tested nationally during the 1978-79 school year. Pretests and posttests of student affective and cognitive gain, coupled with teacher evaluation feedback, will provide guidelines for revision of the materials during the summer and fall of 1979. The final versions of the materials will be published in the fall of 1979. For more information, contact Project QUESST, 855 Broadway, Boulder, Colorado 80302 (303/492-8154).

THE 35 QUESST MODULES

World Nations

"Comparing Nations: Health and Wealth Around the World"
"Nations: Where Do People Live?"
"Around the Globe: Freedom and Quality of Life"
"World Population: Growing, Growing, Gone"
"Global Interdependence"
"Nations: Guns or Butter?"

U.S. Population Trends

"American Immigrants"
"Rural-Urban Migration"
"Problems: Population Data"
"Where People Are Going"

Economic Issues in the United States

"What Americans Earn"
"Income: His and Hers"
"Rising Prices"
"Income and Prices"

Energy Issues

"The Energy Crunch and the Numbers Game"
"Consuming Energy"
"Energy: How Important in My Life?"

American Lifestyle Changes

"The Automobile and the American Lifestyle"
"Advances in Medical Technology"
"Warfare and Technology"

American Government

"Two-Thirds' Majority"
"Give the People What They Want"
"The Government Dollar"
"Pardon Me. . . But Your Image Is Showing"

American Family and Consumer Issues

"Will the Real Average American Family Please Stand Up?"
"The Changing American Family"
"There's a Sucker Born Every Minute"
"But How Do I Know Which One to Buy?"

Quantitative Concepts

"Reading a Bar Graph"
"Reading a Line Graph"
"Reading a Circle Graph"
"Reading a Table"
"Constructing an Index"
"Estimation"
"Numbers in the World"

Publications of Interest

How Do Our Children Grow? To mark the International Year of the Child, the Population Reference Bureau is producing a trio of publications prepared by Magda Cordell McHale, John McHale, and Guy F. Streatfeild, with the assistance of the PRB staff: a 48-page Population Bulletin, WORLD OF CHILDREN; the WORLD'S CHILDREN DATA SHEET, which gives a country-by-country breakdown of the demographics, health and educational status, and nutritional level of the world's 1.4 billion children; and CHILDREN IN THE WORLD, a chartbook of more than 60 graphic displays and tables showing the status of children today.

The production of these publications was funded through the U.S. Agency for International Development. For single copies or other information about the PRB, write to: Circulation Department, Population Reference Bureau, 1337 Connecticut Ave., N.W., Washington, DC 20036.

Feminist Perspective on Law. The GOLDEN GATE UNIVERSITY LAW REVIEW is now publishing an annual issue, "Women's Law Forum," devoted to legal problems that affect women. For a subscription ($3.50 per issue), write to the LAW REVIEW at 536 Mission St., San Francisco, CA 94105. Manuscripts should be submitted to the Board of Editors, "Women's Law Forum," at the above address.

Keeping an Eye on China. CHINA AND THE U.S.: NORMALIZATION AND BEYOND, a special publication of the China Council of The Asia Society and the Foreign Policy Association, is now available for $1.50 from the Foreign Policy Association (345 E. 46th St., New York, NY 10017). The illustrated 32-page bulletin was written by Harry Harding, Jr., a Stanford professor who recently traveled to China. Discounts are available for orders of 10 or more copies; payment in full, plus $0.50 for postage and handling, must accompany orders of $4.50 or less.

Teaching About Energy and the Environment. The Wisconsin Vocational Studies Center at the University of Wisconsin-Madison (964 Educational Sciences Building, 1025 W. Johnson St., Madison, WI 53706) announces three new instructional resources for teaching about solar energy, energy conservation, and the environment.

UNDERSTANDING SOLAR ENERGY SYSTEMS ($7.00, with two sets of 23 transparency masters), by L. Keaton and E. Edington, contains a general introduction to solar energy and specific units focusing on its residential applications. For adults and advanced secondary students.

INTRODUCTION TO ENERGY, by F. Posthuma (9 lessons, 23 activity masters, and 4 charts; $6.50), is designed to give secondary students an overview of energy, its use, and its applications.

ENVIRONMENTAL EDUCATION BIBLIOGRAPHY, by R. Lambert, G. Strey, and C. Kronebock ($3.00), lists hundreds of sources of environmental and energy information. For teachers, researchers, and curriculum developers.

Bridging the Culture Gap. Collins Reynolds, editor and publisher of THE BRIDGE, reminds us that $12.00 will buy an annual subscription to that quarterly review of cross-cultural affairs, published by the Center for Research and Education (1800 Pontiac St., Box 104, Denver, CO 80220). Prepayment of subscription order yelds a bonus: a $2.00 credit on future book purchases.

ChESS BOARD

A Journal Column of the ERIC Clearinghouse

for Social Studies/Social Science Education

By June E. Ramos

Recently, a number of requests have been received at this clearinghouse for more information about consumer education and consumer economics. A variety of materials relating to the topic can be found in the ERIC data base. Use the terms "Consumer Economics" and "Consumer Education" to find additional related documents. Other relevant terms are listed in the THESAURUS OF ERIC DESCRIPTORS.

ED 154 102. SURIVAL SKILLS FOR STUDENTS, by Jerry Blumengarten (New York: Open Doors, 1977), 65 pp. EDRS price: MF $0.83; HC $3.50 plus postage.

This manual is addressed to providing high school students with daily living skills they will need in modern urban settings. Individual lesson plans for teachers are accompanied by simply worded instructional materials. Students are presented with problem-solving exercises in such areas as self-awareness; communication; money, income, and work; consumerism; and making use of tranpsortation and other resources, particularly in New York City.

ED 152 626. HANDBOOK FOR IN-SERVICE TRAINERS IN CONSUMER EDUCATION, by Thomas M. Brooks (Carbondale, Ill.: Southern Illinois University, 1977), 107 pp. EDRS price: MF $0.83; HC $6.01 plus postage.

This handbook for trainers in consumer education contains three main sections: content outlines, learning activities, and resource materials. The areas covered within the content outlines include financial management, consumer credit, and the consumer in the economy. The learning activities section comprises a sampling of activities identified through teacher workshops. The resource list contains films, filmstrips, pamphlets, and articles related to consumer education.

ED 152 602. ECONOMICS CAN BE ELEMENTARY: 30 JUMBO ACTIVITY CARDS FOR TEACHING READING/WRITING SKILLS THROUGH ECONOMICS (Bloomfield Hills, Mich.: Sandra Shurr Publications, 1978), 32 pp. EDRS price: MF $0.83 plus postage; HC not available from EDRS; order from Sandra Shurr Publications, 2800 N. Woodward Ave., Bloomfield Hills, MI 48013 ($4.95).

The activity cards present supplementary ideas and resources related to economic education for use by classroom teachers in grades K-8. The main purpose of the cards is to encourage student discovery of basic economic and consumer concepts through activities which stress reading and writing skills. The 30 activities deal with a variety of basic concepts, including consumers, producers, diversity of goods and services, economists, wants and resources, labor, market economies, budgeting, economic choice, capital resources, competition, advertising, labeling, entrepreneurs, investment, supply and demand, and human resources. Each card outlines one topic/economic idea and suggests a related activity.

ED 150 276. CONSUMER EDUCATION FOR KINDERGARTEN THROUGH GRADE 8 (Springfield, Ill.: Illinois State Office of Education, 1976), 64 pp. EDRS price: MF $0.83; HC $3.50 plus postage.

This guide is designed to help school administrative personnel integrate consumer education into the curriculum at the elementary level and to assist teachers in planning and implementing consumer education concepts at the primary, intermediate, and upper-elementary levels in language arts, mathematics, science, and social studies programs. For each topic contained in the guide there is a content outline followed by performance objectives and related activities for each of the three levels. Topics include consumer rights and responsibilities, factors in money management decisions, money and banking, comparison shopping, using consumer credit, food, clothing, housing, and transportation. A selected educational materials list is appended.

ED 147 255. CONSUMER RESOURCE GUIDE: A SELECTED BIBLIOGRAPHY, compiled by Charlotte Nyheim and Sharon Smith-Hangsgen (Sacramento: California State Department of Consumer Affairs, 1977), 64 pp. EDRS price: MF $0.83 plus postage; HC not available from EDRS; order from Publications Section, State of California, P. O. Box 1015, North Highlands, CA 95660 ($1.50, paperbound).

The selective bibliography contains more than 1,000 citations of books, pamphlets, audiovisual materials, and teaching resources related to consumer education. It is designed for educators as well as for individual consumers and members of consumer organizations. The content is arranged under ten general topics: consumer and the economy, consumer and the environment, consumer behavior/advertising, consumer classics, consumer education, consumer goods and services, consumer protection, money management, periodicals, other bibliographies, and catalogs. Almost all entries have been published since 1970, but the consumer classics section contains older material depicting the history of the consumer movement and relating to past economic situations.

Ordering Information

To order microfiche (MF) of any of the ED documents described above, write to the ERIC Document Reproduction Service (EDRS), P. O. Box 190, Arlington, VA 22210. Hard copies (HC) of some of the documents may also be ordered from EDRS. When hard copies are not available from EDRS, the ordering source is given with the citation.

If there is an ERIC microfiche collection at a nearby university library or school resource and service center, you might prefer to look over specific documents before ordering.

Advisors Sought

Nominations are being sought for persons to serve a three-year term (beginning January 1, 1980) on the Board of Advisors for the Elementary Education section of SOCIAL EDUCATION, the journal of the National Council for the Social Studies.

The Board of Advisors is composed of elementary teachers, consultants, supervisors, publishers, and college/university faculty members. The duties of board members are to suggest themes for future issues of the journal, identify potential authors, review proposals for articles, and evaluate manuscripts; on occasion they assist the editor in planning entire Elementary Education sections. They receive no financial compensation.

Members of the Board of Advisors should hold membership in the NCSS. Since the basic planning of future issues of SOCIAL EDUCATION is done at the NCSS annual meeting, members of the Board of Advisors are expected to attend. Experience as a writer or editor is desirable but not essential.

Applicants should submit vitae and letters describing their experience and competence in the field of elementary social studies to: Ronald Wheeler, Elementary Education Editor, SOCIAL EDUCATION, Department of Education, College of William and Mary, Williamsburg, VA 23185. Deadline for receipt of nominations is October 1.

Films of Note

Award-Winning Filmstrip Series. InterCulture Associates (Box 277, Thompson, CT 06277) offers a series of four sound/color filmstrips about Kenya. HARAMBEE, KENYA! ($90.00, with teacher's guide), written, photographed and narrated by Blair Seitz, won the silver medal at the International Film and TV Festival, held in New York City in November 1978. For intermediate through adult audiences. Write to the publisher to arrange to preview the materials or for a free brochure describing other resources for teaching about Africa.

Growing Up Is a Full-Time Job. The thoughts and concerns of three 9- to 13-year-olds are the focus of Rebop, a new 16mm color film series from the Audio-Visual Center at Indiana University (Bloomington, IN 47405).

MICHAEL (#ESC-1696) recounts the adventures of a 12-year-old California farm boy on a 3,000-mile summer bike trip. KELLY (#ESC-1697) is about a 9-year-old black girl from Watts who is a member of the world's only all-black trapeze troup. A 15-year-old Vietnamese boy who has been adopted by an American family is the subject of THANH (#ESC-1698).

Each film has a showing time of nine minutes and can be purchased for $130.00 or rented for $46.25. Free previewing is available. For intermediate-level through adult audiences.

Documentary Slide Package. "America in the Depression Years" is a new collection of slides copied from the vast photographic files of the Farm Security Administration and the Office of War Information. Created in the 1930s and early 1940s by a group of America's greatest photographers and now housed in the Library of Congress, the images are recognized as the high-water mark of documentary photography of the American people and the changing American landscape. A selection of 450 pictures particularly suited for educational and library use has been prepared in slide form by Instructional Resources Corp. (12121 Dove Circle, Laurel, MD 20811). The price of $225.00 includes limited copying and telecasting rights, plus a guidebook containing a historical introduction, captions, bibliography, and index. The set may be ordered on 30-day approval. An illustrated brochure is available upon request.

SHORT TAKES

Summer Seminar at Sangamon. The Illinois Legislative Studies Center is accepting applications for ISSUE (Institute at Sangamon State University on Energy Education), a three-week conference scheduled for June 11-29 in Springfield, Illinois. Each of the 24 participants selected will receive six hours of academic credit (in either physical science or teacher education) in addition to a $400.00 stipend and a small travel allowance. Tuition costs will be waived by Sangamon State University.

Deadline for applications is April 20. For application forms or further information, contact: W. Williams Stevens, Jr., Illinois Legislative Studies Center, Sangamon State University, Springfield, IL 62708 (217/786-6574).

Pocket Platos? Two 14-day residential workshops in teaching philosophy to children in grades 4-9 will be offered this summer by the Institute for the Advancement of Philosophy for Children, a nonprofit division of Montclair (New Jersey) State College. Participants, who must have bachelors' degrees, will earn six graduate credits from Montclair State College.

The first workshop is scheduled for July 5-18; the second workshop will be held July 19-August 1. The total cost of each session, including room, board, books, and fees, is $500. Workshop participants will reside in the Pocono Environmental Education Center at Dingman's Ferry, Pennsylvania, and attend classes at the New Jersey School of Conservation in Branchville, New Jersey.

For more information or an application form, write to: Prof. Ann M. Sharp, IAPC, Montclair State College, Upper Montclair, NJ 07043. A deposit of $25 must accompany each reservation.

Leadership Conference at Stanford. The School of Education at Stanford University will hold a two-week conference July 15-27 devoted to helping school leaders familiar with current trends in elementary and secondary social studies consider implementation strategies and assessment problems likely to arise with the use of new curriculum materials. Funding will be provided by the National Science Foundation.

Participants will be chosen primarily from large school districts in the western United States, though representatives from the East and Midwest who can pay their own travel costs will be considered. Room and board and some travel expenses will be covered by the NSF grant. Deadline for application is April 30. For an application form, write to: Dr. Richard E. Gross, Director, NSF Social Studies Leadership Conference, School of Education, Stanford University, Stanford, CA 94305 (415/497-4104).

Calendar

May 11-12	National Italian American Foundation. First international conference. Capitol Hilton Hotel, Washington. Theme: "The Role of the American of Italian Heritage in the 1980s." Registration fee: $50.00. For a registration form, write to: First International Conference, National Italian American Foundation, P. O. Box 19165, Washington, DC 20036.
May 13-16	National Caucus on the Black Aged/National Center on the Black Aged. Seventh annual conference. Jackson Holiday Inn Downtown, Lamar and Amite Sts., Jackson, Mississippi. Theme: "Protecting the Consumer Rights of the Elderly: Rural and Urban." For more information write to: Ms. Kathleen B. Coleman, Conference Coordinator, NCBA, 1424 K St., NW, Suite 500, Washington, DC 20005.
May 30-June 3	National Women's Studies Association. First annual conference. University of Kansas, Lawrence, Kansas. Deadline for program advertising (camera-ready copy only) April 15; contact Ms. Charol Shakeshaft, 408 E. 23rd St., Bryan, TX 77801 (713/822-5575 or 845-2436). Deadline for booth displays May 15; contact Dr. Nanette Bruckner, POB 36, 2700 Bay Area Blvd., Houston, TX 77058 (713/488-9370).
June 14-16	Social Science Education Consortium. Annual corporation meeting and invitational conference. Educational Resources Center, Boulder, Colorado. Theme: "American Perspectives in Social Education."

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Annual Leadership Workshop Scheduled by SSEC

The Third Annual Leadership Skill Workshop in Social Studies, sponsored by the Social Science Education Consortium, will be held July 30-August 3 in Boulder, Colorado.

The workshop is designed to provide opportunities for skill development and professional growth to curriculum consultants, department chairpersons, directors of instruction, and other leaders in the field of social studies education. Principal workshop leaders will be James E. Davis, associate director of SSEC and ERIC/ChESS, and Frances Haley, assistant director of the SSEC.

The entire workshop will be conducted at the Williams Village Summer Conference Center at the University of Colorado. Daily sessions will be held from 8:30 a.m. to 4 p.m., with a half-day session on Wednesday, August 1. The workshop will end at 3 p.m. on Friday, August 3. Room and board accommodations at Williams Village will be available to participants.

The workshop fee is $300.00. If more than one person from an organization attends, the fee is $250.00 per participant. Room rates at Williams Village for Sunday through Thursday nights, including meals from breakfast Monday through lunch on Friday, will not exceed $112.52 per person single occupancy and $84.58 per person double occupancy.

Deadline for registration for the workshop is Friday, July 6. A $25.00 deposit must accompany each registration. If fewer than 15 persons register, the workshop will be cancelled and all deposits will be refunded. The balance of the registration fee is due by the first day of the workshop, July 30.

Room reservations must be made directly with Williams Village. Write to: Williams Village Summer Conference Center, University of Colorado, 500 30th Street, Boulder, CO 80310. Specify the following information: name of the conference, type of accommodations you wish, dates of arrival and departure, total number in your party (including number, ages, and sex of children), and your name, address, city, state, and zip code. Room and board charges are payable at check-in.

To obtain a descriptive brochure and a conference registration form, contact: Frances Haley, SSEC, 855 Broadway, Boulder, CO 80302 (303/492-8154).

QUANTITATIVE UNDERSTANDING: A SOCIAL SCIENCE BASIC

by

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July 1979

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ABSTRACT

With the support of a grant from the National Science Foundation, the Educational Resources Center of Boulder, Colorado, is developing and field testing thirty-five one- to three-day learning activities designed to improve students' understanding of quantitative concepts within the context of high school social studies courses.

This two-year project, entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST), is based on the belief that it is important for secondary-level students to learn both the value and the limitations of using quantitative data and methods in the study of social issues.

This article presents a detailed rationale for the development of learning activities that infuse quantitative concepts and skills into secondary-level social studies classes, outlines the phases of project development, and briefly discusses the content of the learning activities developed by the project staff.

Introduction

In 1977 the Educational Resources Center of Boulder, Colorado (an affiliate of the Social Science Education Consortium, Inc.), was awarded a grant from the National Science Foundation to develop learning activities designed to help students in grades 7-12 understand and use quantitative concepts in the study of social issues. This two-year project, Quantitative Understanding to Enhance Social Science Teaching (QUESST), has produced thirty-five one- to three-day learning modules.

During the 1978-79 school year, the Project QUESST materials were field tested by forty-four classroom teachers in the Boston, Denver, and Minneapolis areas. The project staff is now in the process of revising the materials on the basis of field-test results and making arrangements to have the materials published for classroom use.

This article presents a rationale for the project, an outline of the phases of project development, and a brief description of the materials developed by the project.

Rationale for the Project

During the past two decades there has been a trend throughout the social sciences toward more extensive use of quantitative techniques. In 1963 Edward Ackerman recognized this trend in geography and foresaw its impact when he remarked, "The year is not far off when a geographer will be unable to keep abreast of his field without training in mathematics" [1].

Just six years later, Bernard Gelbaum and James March stated that they thought the situation predicted by Ackerman had been attained throughout the social sciences: "Within the past two decades, mathematics has become indispensable to the student of human behavior. Mathematical models, statistics, and computation are the standard tools of the professional" [2].

The growing need for quantitative training is not, however, reflected in the secondary social science curriculum; it is clear that high school students are not being adequately prepared for college-level study of the social sciences. Furthermore, high schools are not adequately preparing graduates to function effectively in a society that employs mathematical techniques in areas ranging from weather prediction to the testing of new food products. A significant and growing need exists for secondary-level curriculum materials that introduce and develop skills and understandings in applying quantitative techniques to issues and problems in the social sciences.

In designing Project QUESST, the project staff identified five key questions related to the need for teaching about quantitative methods and data in the social sciences:

1. To what extent are quantitative techniques currently employed in the social sciences? The Mathematical Sciences Panel of the National Academy of Science's Behavioral and Social Sciences Survey (BSSS) found that "the degree to which a social science has readily admitted mathematical formalization has been closely tied to the ease with which important variables of the science are seen to be numerical" [3, p.23]. Economics and psychology were cited by the panel as those

social science disciplines that have led the way in the use of quantitative techniques.

The importance of such techniques to economics is illustrated by the fact that econometrics--the application of mathematical and statistical methods of the testing of hypot[illegible]es and the analysis of economic data--has become a major component of the discipline:

> Much of the current literature of economics is presented in econometric form. Because both micro- and macroeconomics are concerned with explaining the behavior of systems that contain a large number of highly interdependent variables, the mathematical formulation of these models is quite appropriate. Econometrics has thus given the economist a tool that bridges theory and empirical observation [4].

Other social sciences have accelerated their use of quantitative methods. LaValle, McConnell, and Brown, who explored the expansion of quantitative methods in geography during the period 1954-65, summarized their findings in the following statement:

> Application of statistical procedures in the solution of geographic problems has enjoyed spectacular growth since 1954. Of eighty-one quantitative-statistical dissertations enumerated, only two were completed in 1954. Growth was minimal until 1958. In 1958 the number of statistical dissertations produced per year increased very rapidly until 1964. The year 1954 witnessed the publication of only one quantitative journal article and the number of articles in the literature increased slowly and erratically through 1962. From 1962 to 1965 the production of quantitative journal articles jumped to an average of eleven articles per year [5].

An examination of the journal American Political Science Review (ASPR) over three decades revealed a similar trend in political science [6]. The results of this investigation are summarized in Table 1. [1]

Table 1
about here

A less-sophisticated analysis of more-recent origin was made of the March and December 1976 issues of ASPR. Counting an article, the accompanying comments, and the rejoinder as one, twenty articles were published in these two issues. Of these, thirteen--or 65 percent--used quantitative data and required knowledge of statistical methodology [6].

Sociology and anthropology are also expanding their use of statistical tools. The Sociology Panel of the BSSE asserted:

> Experimental small-group research appears to be becoming increasingly quantitative and systematic. Most investigators take great care in measuring and recording behavior in experimental situations. Refined statistical methods and mathematical models have been used extensively in analyzing group processes, and some investigators are attempting computer simulation of group processes as a way of developing hypotheses [7, p. 39].

The computer also provides an important link between anthropology and quantitative methods:

> Although the computer is not yet as widely used in anthropology as in the other behavioral and social sciences, at least *someone* in 82 percent of anthropology departments uses a computer in his research.

---

[1] The investigators explained their categories thusly: "Articles which made use of only percentages and simple counting . . . were placed in the 'low level quantitative technique' category. To be included in the 'more powerful quantitative technique' category, an article had to utilize techniques assuming ordinal or interval measurement, or employ tests of significance with nominal data" [6].

> The computer is of great service in linguistics; for example, various kinds of relationships between the units of speech and language may be determined by quantitative methods. In modern archaeology, where fragments of pottery are studied for the interrelationships of their design elements, computer analysis may be appropriate. In physical anthropology various morphological relationships are used in the study of species interrelationships [8].

2. For what purposes are quantitative techniques employed by the social sciences? The Mathematical Sciences Panel of the BSSS came to the following conclusion:

> Mathematics is important for the social sciences, as for any science, in at least three related ways. First, there is the axiomatic approach so typical of mathematics. Second, mathematics permits computation and manipulation of concepts. Third, mathematical models make scientific theories precise, and more easily testable and capable of improvement [3, p. 22].

The Mathematical Sciences Panel also found that students of social problems use statistical techniques to help:

--*test* theories and explanations by confronting them with empirical evidence,

--*summarize* a large body of data into a small collection of typical values,

--*confirm* that relationships in the data did not arise merely because of happenstance or random error,

--*discover* some new relationship in the data, and

--*inform* readers about what is going on in the data [9].

LaValle, McConnell, and Brown [5, p. 435] analyzed the kinds of statistical procedures used in geographic research. Their findings illustrate the particular importance of such procedures in discovering and confirming relationships. Increasing attention is being paid in all the social sciences to procedures which help to develop and test hypotheses. These methods have been influential in modifying the conceptual and theoretical frameworks of the social sciences.

Not only have the social sciences changed through the application of quantitative techniques, but the mathematical sciences have been influenced, as well, through their association with the social sciences. This point was well made by John G. Kemeny:

> The social scientist today often finds the mathematician unable to enlighten him on the particular model of interest to him. Many mathematicians have the impression that mathematical problems in the social sciences are entirely trivial. On the contrary, most problems in the social sciences are too difficult for present-day mathematics . . . . [S]ome day the theoretical social scientist will have to know more mathematics than the physicist needs to know today [10].

3. What steps have been recommended for training prospective social scientists in quantitative techniques? There is strong agreement that entering graduate students in the social sciences have not been well prepared in mathematics. The Mathematical Sciences Panel of the BSSS found that "a particular difficulty in the social sciences is that students have often not had as undergraduates the first courses in the mathematical sciences" [3, p. 79]. The Sociology Panel cited the "inadequate mathematical and statistical training of the average sociologist" [7, p. 38]. Furthermore, the Geography Panel found that "entering geography students often have weak mathematical backgrounds, a characteristic shared with several other behavioral and social science disciplines because

of the selection processes built into undergraduate and even secondary school curricula" [11, pp. 124-25].

The impact of such a weakness is illustrated by a point made by the Sociology Panel: "Departments of sociology find too many of their students unprepared--and unmotivated--in mathematical and statistical skills. As a consequence, they must introduce special courses in mathematics, logic and statistics before specialized techniques can be mastered" [7, p. 42]. The need for such immediate, stop-gap measures was also cited by the Geography Panel: "In geography, at least, it is likely that the attainment of better fundamental mathematical understanding will require remedial work for some time to come [11, p. 126].

Remedial work in mathematics for entering graduate students cannot, however, meet the long-range needs of the social sciences. One step that may be taken is to require undergraduate work in the mathematical sciences for admission to graduate social science departments [3, p. 80]. This step was supported by the Geography Panel in its assertion that "ideally, course work in calculus, probability theory, and linear algebra would be part of an undergraduate major program" [11, p. 126].

Mathematical training for the social sciences should emcompass both the fundamental concepts and basic theory of quantitative methods and their specific application to social issues and problems. The importance of mathematical theory was highlighted by the Mathematical Sciences Panel:

> Should theory or methods be taught, and which comes first? Many social science departments tend to over-

> emphasize mathematical science methods as opposed to rationales; that is, how to invert a matrix rather than properties of the inverse, how to perform a test of significance rather than why to use a test of significance, how to use a specific program rather than how to compute efficiently and accurately. When students are going to take several courses in a particular mathematical science area, then some of that course work should be theoretical [3, p. 81].

That such mathematical theory should be balanced by understanding of the social sciences is a key point made by Edward R. Tufte:

> Some studies, in the words of one critic, "use statistics as a drunk uses a street lamp, for support rather than illumination." Quantitative techniques will be more likely to illuminate if the data analyst is guided in methodological choices by a substantive understanding of the problem he or she is trying to learn about. Good procedures in data analysis involve techniques that help to (a) answer the substantive questions at hand, (b) squeeze all the relevant information out of the data, and (c) learn something new about the world [9].

The importance of incorporating the use of quantitative techniques into social science courses was reinforced by the Mathematical Sciences Panel, which claimed that "insofar as social science departments require competence in the mathematical sciences, that competence should be used in the social science courses" [3, p. 80]. The fact that increasing numbers of social science departments are now including courses in quantitative techniques was emphasized by LaValle, McConnell, and Brown:

> Within the last ten years there has been an apparent minor revolution in the training of geographers in quantitative methods. Ten years ago only two of the geography departments in universities granting the Ph.D. offered courses in quantitative methods. Today, in contrast, approximately 76 percent of all such departments offer at least one course, and many others strongly urge students to take quantitative method courses in other departments [5, pp. 426-28].

4. To what extent are basic quantitative techniques important in the day-to-day activities of individuals who will receive no advanced training in the social sciences? Such techniques obviously have value for students who terminate their formal education with high school or who do not pursue university-level studies in the social sciences. H.G. Wells had an early appreciation for the importance of statistics, as evidenced by his statement "Statistical thinking will one day be as necessary for efficient citizenship as the ability to read" [12].

Incorporating quantitative techniques in secondary social science curricula will help students progress in many of the following basic mathematical skills areas, identified by the National Council of Supervisors of Mathematics [13]:

Problem solving. Students should be able to solve problems in situations which are new to them.

Applying mathematics to everyday situations. Students should be able to use mathematics to deal with situations they face daily in an ever-changing world.

Alertness to reasonableness of results. Students should learn to check to see that their answers to problems are "in the ball park."

Estimation and approximation. Students should learn to estimate quantity, length, distance, weight, etc.

Appropriate computational skills. Students should be able to use the four basic operations with whole numbers and decimals, and they should be able to do computations with simple fractions and percents.

Geometry. Students should know basic properties of simple geometric figures.

Measurement. Students should be able to measure in both the metric and customary systems.

Tables, charts, and graphs. Students should be able to read and make simple tables, charts, and graphs.

Using mathematics to predict. Students should know how mathematics is used to find the likelihood of future events.

Computer literacy. Students should know about the many uses of computers in society, and they should be aware of what computers can do and what they cannot do.

The assumption that basic mathematical skills are important in "opening and closing doors" was supported by Berkeley sociologist Lucy Sells in a 1973 study of freshmen at the University of California. Sells found that 57 percent of all male first-year students had taken four years of high school math, while only 8 percent of the females had done so. As a result, 92 percent of freshmen women could major in only five out of twenty available fields, since calculus was a requirement for the other fifteeen [14].

To make clear the link between statistics as a branch of the mathematical sciences and the real world of the average citizen, the American Statistical Association (ASA) and the National Council of Teachers of Mathematics (NCTM) established the Joint Committee on the Curriculum in Statistics and Probability. This committee was concerned with presenting an image of statistics as "a part of the mathematical sciences that deals with many practical, as well as esoteric, subjects and is especially organized to treat the uncertainties and complexities of life and society" [15, p. ix]. The published report of the ASA-NCTM committee, *Statistics: A Guide to the Unknown,* clearly illustrates manyof the contributions statisticians make to society. Among the examples treated are a study to determine the relative safety of anesthetics, a study of the effect of smoking on health, applications of statistics to the practice of law, the projection of winners on election night, the relationship of voting behavior to other social variables, estimating demand for new products, and computing weather probability [15]. This partial listing makes it evident that the secondary social studies classroom is rich in opportunities for relating quantitative methods to real-life issues and problems.

A final word on the importance of statistics to everyday life seems warranted: We, as citizens, make choices and decisions, whether or not we are aware of it, based on inferences from samples in the form of manufacturers' claims for products, the results of consumer polls, the results of political polls, or the published results of scientific research. If we as citizens truly desire to maintain the power to make decisions affecting our lives, we must know how to evaluate quantitative data and findings--when to believe them, when to question them, and when to reject them.

5. What is currently being done in secondary social studies curricula to introduce and develop skills in the application of quantitative techniques? Until now, there has been no systematic attempt to install secondary social science curricula that develop the skills and understandings necessary for the application of quantitative techniques. Our analysis of six widely used secondary social science texts is illustrative. Each book contains several charts or graphs, almost all of which represent low-level quantitative techniques—i.e., percentages and simple counting. Our analysis sought to discover the extent to which these data or techniques were "adequately explained." If the narrative described the data gathering/organizing/analysis technique represented in the chart or graph, an adequate explanation was assumed. The absence of such information in the nar-

rative meant that the methods and/or data were not adequately explained. The findings of this analysis are shown in Table 2.

Table 2 about here

An ERIC search of documents and articles related to mathematics, statistics, secondary social science/studies, etc. reveals that most current mathematical applications in social studies are found in consumer education programs. The skills most frequently developed in these programs tend to be computational rather than analytical in nature. One article, "Restoration of Prestige to Practical Mathematics," in the December 1974 issue of *High School Journal,* discusses applications of mathematics to social problems.

A similar lack of concern with mathematical/quantitative techniques was found in the last ten yearbooks of the National Council for the Social Studies. In only one of the ten were quantitative techniques dealt with as an integral part of the social sciences/studies. The 1970 yearbook, *Focus on Geography: Key Concepts and Teaching Strategies* edited by Phillip Bacon, includes a chapter by George W. Carey entitled "Systems, Model Building, and Quantitative Methods." Carey's focus, however, is on the use of these techniques in the field, not on how they may be introduced and developed in secondary social science courses.

As a result of the growth in the use of quantitative methods in the social sciences and in society in general and the lack of concurrent growth in their use in secondary social science curricula, an increasing gap exists between secondary curricula and the colleges and society. The goal of Project QUESST is to help reduce this gap, in order to better prepare students for life in today's society as well as for college-level work in the social sciences.

Development of Project QUESST

The initial task of the Project QUESST staff was to identify and define (1) significant quantitative concepts, (2) specific quantitative skills and techniques, and (3) specific social issues and social studies courses to be treated in the project materials. A consultant panel of ten social scientists met in Boulder, Colorado, in January 1978 to help the project staff identify and define appropriate quantitative concepts, skills, and techniques. This panel of consultants, which included representatives from the various social science disciplines, history, statistics, and education, were selected for their knowledge of quantitative techniques and their interest in precollegiate education. Specific social studies issue areas and courses appropriate for treatment by quantitative learning activities were identified by interviewing approximately sixty secondary (grades 7-12) classroom teachers in two urban districts, two suburban districts, and one rural district in Colorado. Additionally, a graduate assistant conducted an analysis of major secondary textbooks to determine the extent to which social studies texts deal with basic quantitative concepts and skills.

The project staff used this information to select the specific social issues and quantitative concepts, skills, and techniques that would form the basis of the materials to be developed. During the ensuing nine-month period, the staff developed and field tested thirty-five one- to three-day learning-activity modules to supplement existing secondary social studies courses. As Table 3 shows, these activities range across the social science disciplines; many are appropriate for

Table 3
about here

inclusion in more than one course. For example, the activity "Income: His and Hers," a module dealing with the disparity in average incomes between males and females, could be used readily in courses treating current American history, economics, sociology, or social issues.

Each activity focuses on an important social studies topic and introduces students to one or more quantitative concepts and skills. For example, "Around the Globe" is primarily a world history lesson in which students use indicators and indexes to compare degrees of political freedom and levels of physical quality of life among various nations of the world. Included in the teaching procedures is a discussion of both the strengths and the weaknesses of the quantitative concepts presented to students in the activity.

"Give the People What They Want" is an activity designed primarily for use in an American government course, though it could be easily incorporated into a sociology or social issues course. This activity raises two basic questions: How do local-government officials know what their constituents want? How can government decision makers systematically obtain citizens' views on current issues?

In the opening lesson of this activity, students role-play five city council members who must make decisions about the city's recreation budget. Each council member is given one piece of information on which to base an initial decision.

The role play raises a number of questions: How were the council members' decisions influenced by the information that they had received? Which kind of information might have had the greatest impact on the decision reached? In what way is each piece of information biased? If obtaining the views of citizens is important, what techniques might be used to obtain reliable citizen input on issues?

Discussion of a six-step outline of the decision-making process helps students become aware that citizen input can be valuable at all stages of the process, from identifying problems or issues to judging the effectiveness of actions taken to resolve problems.

The suggestion that a survey of citizens' opinions might be conducted--which is almost always advanced during class discussion at this point--leads to the next step: a card-sort activity in which students organize seven separate steps in the survey process in logical order, from identifying the topic to be surveyed to analyzing and interpreting survey results.

The concluding lesson of this activity presents students with a survey questionnaire based on the recreation issue facing the city council in the role-play activity. After reviewing and critiquing the questionnaire, students develop and conduct a local or school survey to answer a question or address an issue of their own choosing.

Each of the thirty-five learning activities states instructional objectives, identifies appropriate grade level and suggested teaching time, presents detailed teaching procedures, and contains all student materials required to conduct the activity in the classroom. Data sources are identified so that teachers and students may update data using readily available library resources.

The project staff is now attempting to arrange for commercial publication of the materials, which have been revised on the basis of field-test results. For further information contact Project QUESST, 855 Broadway, Boulder, Colorado 80302 (303/492-8154).

REFERENCES

1. E.A. Ackerman, Where Is a Research Frontier?, Annals of the Association of American Geographers, 53:4, p. 432, 1963.

2. B.R. Gelbaum and J.G. March, Mathematics for the Social and Behavioral Sciences, W.B. Saunders Co., Philadelphia, 1969.

3. W. Kruskal (ed.), Mathematical Sciences and Social Sciences, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1970.

4. N.D. Ruggles (ed.), Economics, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, p. 6, 1970.

5. P. LaValle, H. McConnell, and R.G. Brown, Certain Aspects of the Expansion of Quantitative Methodology in American Geography, Annals of the Association of American Geographers, 57:1, pp. 423-436, 1967.

6. A. Somit and J. Tanehaus, The Development of American Political Science, Allyn and Bacon, Boston, 1967.

7. N.J. Smelser and J.A. Davis (eds.), Sociology, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1969.

8. A.H. Smith and J.L. Fischer (eds.), Anthropology, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1970.

9. E.R. Tufte, Data Analysis for Politics and Policy, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, p. 1, 1970.

10. J.G. Kemeny, Mathematics Without Numbers, Daedalus, 88:4, p. 578, 1959.

11. E.J. Taaffe (ed.), Geography, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1970.

12. Quoted in D. Huff, How to Lie With Statistics, W.W. Norton and Co., New York, 1954.

13. National Council of Supervisors of Mathematics, Position Paper on Basic Mathematical Skills, n.d.

14. Math Mystique: Fear of Figuring, Time, March 14, 1977, p. 36, 1977.

15. J.M. Tanur (ed.), Statistics: A Guide to the Unknown, Holden-Day, Inc., San Francisco, 1972.

16. Human Sciences: A Developmental Approach to Adolescent Education, Biological Sciences Curriculum Study, Boulder, Colorado, p. 60, 1973.

Table 1

IMPACT OF BEHAVIORALISM IN POLITICAL SCIENCE AS REFLECTED IN THE CONTENTS OF *AMERICAN POLITICAL SCIENCE REVIEW* [6]

	1946-48		1950-52		1963-65	
	#	%	#	%	#	%
Low-level quantitative techniques	15	10.9	15	11.4	19	18.3
More-powerful quantitative techniques	1	.7	6	4.5	23	22.1
Discussions of scientific method	6	4.3	5	3.8	2	1.9
Analytic theory	---	---	17	12.9	17	16.3
Other	116	84.1	89	67.4	43	41.3
Totals	138	100.0	132	99.9	104	99.9

Table 2

ADEQUACY OF EXPLANATIONS OF QUANTITATIVE DATA IN SIX SECONDARY SOCIAL SCIENCE TEXTS

Title and Author(s)	Publisher and Date	No. of Charts or Graphs With Quantitative Data	No. for Which Adequate Explanations NOT Provided
World Geography J.H. Bradley	Ginn & Co. 1971	52	28
Economics in Action J.D. Calderwood and G.L. Fersh	Macmillan Co. 1968	72	63
Psychology: Its Principles and Applications T.S. Engle and L. Snellgrove	Harcourt Brace Jovanovich 1974	63	40
The Study of Anthropology D.E. Hunter and P. Whitten	Harper & Row 1976	19	8
Sociology P.H. Landis	Ginn & Co. 1975	58	51
Magruder's American Government W.A. McClenaghan	Allyn & Bacon 1975	87	69

Table 3

THE THIRTY-FIVE QUESST LEARNING ACTIVITIES, BY TOPIC

World Nations	"Comparing Nations: Health and Wealth" "Nations: Where Do People Live?" "Around the Globe: Freedom and Quality of Life" "World Population: Growing, Growing, Gone" "Global Interdependence" "Nations: Guns or Butter?"
U.S. Population Trends	"American Immigrants" "Rural-Urban Migration" "Problems: Population Data" "Where People Are Going"
Economic Issues in the United States	"What Americans Earn" "Income: His and Hers" "Rising Prices" "Income and Prices"
Energy Issues	"The Energy Crunch and the Numbers Game" "Consuming Energy" "Energy: How Important in My Life?"
American Lifestyle Changes	"The Automobile and the American Lifestyle" "Advances in Medical Technology" "Warfare and Technology"
American Government	"Two-Thirds' Majority" "Give the People What They Want" "The Government Dollar" "Pardon Me . . . But Your Image Is Showing"
American Family and Consumer Issues	"Will the Real Average American Family Please Stand Up?" "The Changing American Family" "There's a Sucker Born Every Minute" "But How Do I Know Which One to Buy"
Quantitative Concepts (remedial)	"Reading a Bar Graph" "Reading a Line Graph" "Reading a Circle Graph" "Reading a Table" "Constructing an Index" "Estimation" "Numbers in the World"

Project QUESST Modules

This attachment consists of copies of learning modules developed by the Project QUESST staff.

Attachment #10 lists the modules by title, topic, and social studies and quantitative concept.

cluster 1

COMPARING NATIONS:
HEALTH AND WEALTH AROUND THE WORLD

A module for teaching secondary
students about health and
wealth among nations with the
aid of quantitative concepts.

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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2. How Wealthy? (Answer Sheet)
3. Wealth and Income (Information Sheet)

Student Materials

1. Health and Wealth Around the World
2. How Healthy?
3. How Wealthy?

OVERVIEW OF THE MODULE

Introduction

Among the nations of the world, which countries are the healthiest and wealthiest? How may we compare differences and similarities among the world's nations? What indicators or types of data would help us to compare more accurately? This module explores these questions and focuses on some of the limitations of data commonly used to make cross-national comparisons. The module also introduces students to concepts used in comparisons, including average, rank order, and range.

When studying world cultures or world geography, students commonly make comparisons between nations. If they are to describe and compare accurately, it is essential that they learn some basic comparative skills. This module focuses on the investigation of two indicators (life expectancy and average income) of the relative health and wealth of various nations around the world. The module is a good introduction to the comparative study of cultures and nations.

Description of Materials

Courses and Topics:

World History: Quality of life, health, and development.

World Geography: Wealth and development.

Grade Level:

7-9: Basic activity.

10-12: With suggested activities for advanced students, the starred (**) items.

Time Required: Two class periods.

Concepts and Skills:

Social Studies Concepts: Health, wealth, and income.

Quantitative Concepts: Numbers (indicators), rank order, range, and average (mean).

Thinking Skills: Comparing and interpreting.

Instructional Objectives:

At the conclusion of this module, students will be better able to :

1. Compare the relative health of nations, using life expectancy as an indicator of health.
2. Compare the relative wealth of nations, using an average income measure as an indicator of wealth.
3. Place data in rank order and identify the range.
4. Identify some limitations of information commonly gathered and used by government agencies and international organizations.

Sources of Data:

The 1976 editions of the Demographic Yearbook and the Statistical Yearbook were the sources of information presented in this module. The Yearbooks are published annually by the United Nations.

LESSON 1: HEALTH IN THE WORLD

Introducing the Lesson

1. Distribute "Health and Wealth Around the World" (Student Materials #1) and have students complete the quiz. A teacher answer sheet is provided in Supplementary Teacner Materials #1.

2. Lead a brief discussion of the correct answers. Emphasize that the discussion is based on the two common indicators frequently used by governments and international organizations to measure health and wealth. Indicate that:

   --The United States is among the healthiest nations, but it is not the healthiest nation in the world, based on life expectancy as an indicator of health.

   --The United States is among the wealthiest nations, but it is not the wealthiest nation in the world, based on a measure of average income as an indicator of wealth.

3. Clarify for students that:

   --Long life (life expectancy) is used as an INDICATOR of good health in a nation.

   --Life expectancy is defined as the average number of years a person born in a specific country in a specific year might expect to live. For example, females born in Sweden in 1975 would be expected to have an average lifespan of 77-1/2 years.

   --Indicator is defined as something which indicates or illustrates a larger whole. For example, life expectancy is an indicator of health. However, there are other possible indicators for health including the number of doctors or hospitals per 10,000 people, the infant mortality rate, and nutritional levels of the population.

4. Summarize that indicators (life expectancy and average income in this module) are valuable social science tools which help us to describe and to compare among nations more complex social realities, such as health and wealth.

Developing the Lesson

5. Suggest to students that health is important to all people in all nations. In fact, good health is frequently used as one indicator of the quality of life in a nation. The importance of health and life is emphasized in the American Declaration of Independence which states that all people have an unalienable right to life (as well as liberty and the pursuit of happiness). Distribute and have students review briefly "How Healthy?" (Student Materials #2).

6. Student Materials #2 presents the two nations with the highest and the lowest life expectancy rates for the geographic regions of Africa, Asia, Europe, the Middle East, North America, and South America. For comparative purposes the United States is included separately.

--The RANGE is automatically indicated to us by the presentation of the highest and lowest nations either in the world or in a specific region. The range is defined as the distance or amount of difference between the highest and lowest figures. For example, the range for life expectancy of males in the world is the difference between Sweden and Chad. 72.1 years - 29.0 years = a range of 43.1 years. The ranking is:

High Nation	Region	Low Nation
South Africa	Africa	Chad
Japan	Asia	Bangladesh
Sweden	Europe	Albania
Israel	Middle East	Yemen
Canada	North America	Mexico
Argentina	South America	Bolivia

> For geographic reasons Mexico is included under North America. In other contexts Mexico, for cultural and linguistic reasons, is included under Central America.

7. Lead a brief discussion of life expectancy as an indicator of health around the world. Emphasize the following questions and points:

--According to the indicator, which countries are healthier than the U.S.? Sweden, Japan, and Canada.

Not included in the table because they are not the healthiest nations in their regions, but are still healthier than the U.S. according to the indicator, are Denmark, France, Iceland, the Netherlands, Norway, and Switzerland.

--What is the range for males and females, between the healthiest nation and the least healthy nation in the world? Between Sweden and Chad the range is 72.1 - 29.0 = 43.1 years for males and 77.5 - 35.0 = 42.5 years for females.

--At this point you may wish to have the class, in small groups, compute the range for health for specific regions of the world and to locate the healthiest and least healthy nations on a world map. The ranges, by geographic regions are:

Africa, male range	49.8-29.0=20.8 years
female range	53.3-35.0=18.3 years
Asia, male range	71.1-35.8=35.3 years
female range	76.3-35.8=40.5 years
Europe, male range	72.1-64.9= 7.2 years
female range	77.5-67.0=10.5 years
Middle East, male range	70.1-43.7=26.4 years
female range	73.2-45.9=27.3 years
North America, male range	69.3-61.0= 8.3 years
female range	76.3-63.7=12.6 years
South America, male range	65.1-45.7=19.4 years
female range	71.3-47.9=23.4 years

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**--With advanced students or classes, discussion could focus here on the effects that shortened life expectancy could have upon family structure and family planning, career planning, and the economic and political development of a nation.

--On the average, who lives longer--males or females? Females. The causes are complex or unknown. One major cause may be physiological differences, though this vague term actually tells us little. That men may be more frequently involved in warfare and have more hazardous or strenuous jobs may be additional causes in many nations.

--Nations differ in life expectancies of their populations, as indicated by the ranges illustrated in Student Materials #2. The causes of these differences are many and varied. They include the differing availability and cost of nutritious food, availability and cost of medical care, and knowledge of hygiene. The most important single cause of differing life expectancy rates among nations is differing infant mortality rates.

Concluding the Lesson

8. State that life expectancy is one, but only one, indicator of health. Have students in small groups, "brainstorm" a list of other possible indicators of health. Other indicators could include the number of doctors and nurses or clinics and hospitals, the availability and cost of medical services and insurance, infant mortality rates, level of hygiene knowledge, caloric intake, and general air and water pollution levels. Have groups share their lists with the class. Make a class list of the five best indicators, being careful to define what you define as "best."

9. Summarize that:

   --Indicators are useful social science tools which help us to describe and to compare nations.

   --Range is a useful concept which helps us to know the upper and lower limits or boundaries of the indicator being used.

LESSON 2: WEALTH IN THE WORLD

Introducing the Lesson

1. Distribute "How Wealthy?" (Student Materials #3). Have the students place the nations in RANK ORDER from the wealthiest nation to the least wealthy. Also, have the students find the range between the wealthiest nation and the least wealthy. A teacher answer sheet is provided in Supplementary Teacher Materials #2.

NOTE: For background information, teachers should read "Wealth and Income," Supplementary Teacher Materials #3.

2. Clarify for students that:

--Average yearly income (average yearly gross domestic product) per person is used as an indicator of wealth.

--Average yearly income is defined as the amount of income that each citizen would receive if the total annual income of the nation were divided equally among all citizens.

--Rank order is defined as an order from high to low, large to small, etc.

Developing the Lesson

3. Suggest to students that wealth is important to all people in all nations. In fact, wealth is sometimes used as an indicator of the ability to be able to attain a good quality of life in a nation.

**--With advanced students or classes, discussion could focus here on the differences between wealth and income outlined in Supplementary Teacher Materials #3.

--Student Materials #3 presents the two nations with the highest and the lowest average yearly incomes per person for the geographic regions. The ranking is:

High Nation	Region	Low Nation
Gabon	Africa	Mali
Japan	Asia	Bhutan
Switzerland	Europe	Greece
Kuwait	Middle East	Yemen
United States	North America	Mexico
Venezuela	South America	Bolivia

European nations from the communist bloc do not report measures of income and production and therefore could not be included.

4. Lead a brief discussion of average yearly income (gross domestic product) per person as an indicator of wealth around the world. Emphasize the following points and questions:

--According to the indicator, which countries are wealthier than the U.S.? Kuwait and Switzerland.

Not included in the table because it is not the wealthiest nation in its region but still wealthier than the U.S., according to the indicator is Sweden.

--What is the range between the wealthiest nation and the least wealthy nation in the world? Between Kuwait and Bhutan the range of income is $8,042-$47 = $7,995.

--At this point you may wish to have the class, in small groups, compute the range for income for specific regions of the world and to locate the wealthiest and least wealthy nations on a world map. The ranges, by geographic regions, are:

Africa	$1,391 - $ 54 = $1,337
Asia	$3,753 - $ 47 = $3,706
Europe	$6,387 - $1,811 = $4,576
Middle East	$8,042 $ 129 = $7,913
North America	$6,189 - $ 883 = $5,306
South America	$1,567 $ 201 = $1,366

--Ask why nations differ in their average yearly income and in the sources of that income. For example, Kuwait and Venezuela are essentially oil exporting nations. The United States is an industrial products and food exporting nation. Switzerland is primarily a financial and tourist center. You might also wish to discuss why regions as a whole differ in average income.

--Indicate that nations also differ in how the average yearly income of their citizens is spent. How income is spent is highly dependent upon both the availability and the cost of goods and services.

The way in which income is spent is also influenced by cultural differences and personal preferences.

Concluding the Lesson

5. State that average yearly income (gross domestic product) per person is one, but only one, indicator of wealth. Break the class into groups and have them compete to develop the most extensive list of other possible indicators of wealth. Other indicators could include the size of the nation's gold or foreign currency reserves, the worth of all commercial and industrial buildings, the total number of miles of railway track or paved highways, the estimated value of reserves of raw materials, and intangibles such as the value of a stable government. Again, as a class, select the five best indicators of wealth and justify your selection.

6. Summarize that:

   --Indicators are useful social science tools which help us to describe and to compare nations.

   --Rank order is useful because it places nations in a logical order or sequence.

   --Range is useful because it identifies the limits of the measure being used to describe and compare nations.

LESSON 3: QUALITY OF INFORMATION

Introducing the Lesson

1. Ask students if they agree that the quality of the information that is available to us will influence our ability to compare nations accurately. If so, why?

Developing the Lesson

2. Suggest that to describe and to compare accurately we need information which is complete and accurate. An important aspect of working with any information is to know some of the limitations of the information being used. Ask:

   --Information may be gathered by governments but governments have different capabilities to gather information. Why? For example, a national census in an urban, industrial nation generally will be more complete and accurate than a census in a rural, agrarian nation.

   --Information may be falsely reported. Why? For example, a nation may wish to report a false, low average yearly income per capita to obtain a greater amount of foreign aid and a nation may wish to report a false, high life expectancy rate in order to obtain greater prestige among nations.

   --Information about averages tells us a great deal, but it also fails to tell us some things. Why? For example, average yearly income tells us what each person would receive as income if all income were equally distributed. But, of course, income is never distributed equally. Given two countries with the same average income one country could have many poor and many rich citizens, with few middle income citizens, whereas the other country could have few poor and rich citizens and many middle income citizens.

   --Information frequently includes indicators that are defined differently in different nations. Why? For example, literacy rates are used as an indicator of education yet there is no standard definition of literacy. Literacy may be defined in one nation as little more than the ability to write one's own name. In another nation, literacy may be defined as the ability to read and interpret a paragraph. However, sources such as the United Nations materials would report literacy rates with no distinction drawn between the different definitions. Clearly the different definitions are not comparable.

--Data used as indicators may not mean the same thing to people in different nations. Why? This is especially true with the use of dollar figures to indicate differences in wealth or income between nations. In the comparisons made in this module, the money figures of other nations have been converted to dollars, using exchange rates between various currencies which may or may not be realistic. An "unrealistic" exchange rate would be one controlled by a nation, so that it is either higher or lower than it would be if it were not controlled. An even greater problem is the difference that exists between countries with respect to cultural norms and differences in the availabiltiy of goods. A wealthy country develops products and habits that are economically costly; a poor country maintains lower-cost products and habits. For example, in wealthy nations travel may be primarily by private automobile and airplane, whereas in poor nations travel is more likely to be by foot or bus. Families in Bhutan do manage to live (an average life expectancy of 43.6 years) on the equivalent of an income of less than $50 a year, whereas a family in the U.S. could not exist on an income of $50 per month.

Concluding the Lesson

3. Summarize that:

--Most information will have some limitations due to the way the information is collected, interpreted, and used.

--Limitations imply that we need always try to know the limitations of information and to be cautious in how information is used.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. INDICATORS such as average yearly income and life expectancy are valuable social science tools that can help to describe and to compare larger, more complex social realities such as wealth and health. We should be aware, however, that the selection of an indicator will in part define and limit the larger social reality to be investigated.

2. INDICATORS are representative of larger social realities such as health and wealth. There are many indicators which could be selected in most cases. The selection of an indicator will be based on a number of factors, including availability of information, personal preference, and reason for conducting the investigation.

3. RANK ORDER is a valuable technique because it places information in a logical order which can help us to describe and to compare the extremes of the measures used. Students should be aware that rank order gives the relative positions of the items ranked but does not imply anything about the amount or distance between items on the rank order list.

4. RANGE is a useful concept because it enables us to establish the difference between the extremes (the limits) of the measures used.

5. AVERAGE is a valuable concept because it gives a single measure which in many cases is a good representation of a large amount of information. Average is the most frequently used means of making comparisons between two sets of measures.

6. Most information will have some LIMITATIONS due to the way the information is collected, used, presented, and interpreted. Limitations do not mean that we should be afraid to use information. Limitations do mean that we must understand the limitations and use information carefully.

ADDITIONAL ACTIVITIES

1. Have students identify for any selected geographic region one nation about which they would like to learn more, identify three important types of quantitative information, and indicate why that information would be useful and interesting. Have students locate their information in the library, by writing an embassy, or by other means.

2. Have students identify one indicator about which they would like to learn more and to indicate why that indicator is of interest. Have them select a geographic region and search out the information on their indicator for a number of nations in that region.

3. After the students have studied average incomes for various countries, ask them to locate on a world map the countries listed in Student Materials #3. Are there some parts of the world where high-income countries are concentrated? Where low-income countries are concentrated? What reasons can students suggest for such locations?

4. In this module, average income has been used as an indicator for wealth. The use of indicators in daily life is very common. If a family lives in an expensive house, we assume that the house is an indicator of high wealth or income. If a person appears to be happy we usually assume that the person actually is happy. Again, we have used an indicator. These are common uses of indicators--to give us information about things we cannot easily measure directly. Another common use of indicators is as predictors; a falling barometer indicates (predicts) bad weather to come. In small groups or class discussion, have students suggest common indicators with which they are familiar.

COMPARING NATIONS

SUPPLEMENTARY TEACHER
MATERIALS #1
(Answer Sheet)

HEALTH AND WEALTH AROUND THE WORLD

1. Wealthiest--per capita Gross Domestic Product.

______	Sweden	$6,194
______	U.S.A.	$6,189
Kuwait	Kuwait	$8,042
______	Switzerland	$6,387

2. Least wealthy of the four-- U.S.A. .

3. Healthiest--longest life expectancy.

______	Japan	Males--71.1 years,	Females--76.3 years
______	Canada	Males--69.3 years,	Females--76.3 years
______	U.S.A.	Males--68.2 years,	Females--75.9 years
Sweden	Sweden	Males--72.1 years,	Females--77.5 years

4. Least Healthy of the four-- U.S.A. .

5. None. There is no available answer. Many countries do not collect or do not report this information. A major problem frequently encountered when we want to compare countries is that the information we want is not available to us.

From materials in the Statistical Yearbook: 1976, United Nations, pp. 79-83 and pp. 639-643.

SUPPLEMENTARY TEACHER
MATERIALS #2
(Answer Sheet)

HOW WEALTHY?

A. Rank Order--wealthiest to least wealthy.

1.	Kuwait	$8,042--highest in the world and in the Middle East
2.	Switzerland	$6,387--highest in Europe
3.	United States	$6,189--highest in North America
4.	Japan	$3,753--highest in Asia
5.	Greece	$1,811--lowest in Europe
6.	Venezuela	$1,567--highest in South America
7.	Gabon	$1,391--highest in Africa
8.	Mexico	$ 883--lowest in North America
9.	Bolivia	$ 201--lowest in South America
10.	Yemen	$ 129--lowest in Middle East
11.	Mali	$ 54--lowest in Africa
12.	Bhutan	$ 47--lowest in Asia

B. Range--between the highest average income and the lowest, the range is $8,042 - $47 = $7,995.

From the Statistical Yearbook: 1976, United Nations, pp. 639-643.

WEALTH AND INCOME

WEALTH and INCOME are two distinct economic concepts:

--WEALTH is the stock of useful things in existence at a particular time. "Useful things" would include residential buildings, commercial and industrial buildings, all types of machinery, and such raw material wealth as known petroleum and timber reserves.

--INCOME is the flow of goods and services, usually measured in monetary terms, over a period of time--a week, month, or a year.

No country has complete and reliable information on its wealth. Most countries have fair to excellent information on their income. Further, wealth and income are closely related; when one is high, the other is also likely to be high and when one is low, the other is likely to be low. Therefore, income may be used as a rough indicator of wealth.

For technical reasons, gross domestic product is usually used for comparisons between countries, as in this module, while gross national product is more often used as a measure of income within the United States. The two measures do not differ much from each other. Personal income, which in the United States amounts to about eighty percent of gross national product, would be a better basis of international comparisons, but this measure is not available for many countries. In international comparisons, therefore, the method of this module is usually employed.

HEALTH AND WEALTH AROUND THE WORLD

Place a check mark in front of the name of the country best described by each statement.

1. Of all the countries in the world, my citizens are the wealthiest. In 1973 the average income of all of my citizens was $8,000 a year. That is, a family of four, in which each person had an average income, would have a family income of $32,000 a year.

____________ SWEDEN ____________ U.S.A.

____________ KUWAIT ____________ SWITZERLAND

2. Of the four countries listed below, my citizens are the poorest. In 1973 the average income of all my citizens was only $6,000 a year.

____________ SWEDEN ____________ U.S.A.

____________ KUWAIT ____________ SWITZERLAND

3. Of all the countries in the world, my citizens are the healthiest. My citizens live longer lives, on the average than do the citizens of any other country.

____________ JAPAN ____________ CANADA

____________ U.S.A. ____________ SWEDEN

4. Of the four countries listed below, my citizens are judged the least healthy because their average lifespan is shorter than the lifespan of citizens of the other three countries.

____________ JAPAN ____________ CANADA

____________ U.S.A. ____________ SWEDEN

5. Of all countries in the world, I am the dirtiest. I have the worst air and water pollution of any country.

____________ INDIA ____________ SOVIET UNION

____________ U.S.A. ____________ MEXICO

____________ FRANCE

HOW HEALTHY?

COUNTRY	MALES	FEMALES
1. Sweden	72.1 yrs.	77.5 yrs.
2. Japan	71.1	76.3
3. Canada	69.3	76.3
4. United States	68.2	75.9
5. Israel	70.1*	73.2*
6. Argentina	65.1	71.3
7. Albania	64.9	67.0
8. Mexico	61.0	63.7
9. South Africa	49.8	53.3
10. Bolivia	45.7	47.9
11. Yemen	43.7	45.9
12. Bangladesh	35.8	35.8
13. Chad	29.0	35.0

---

* Israel's fifth place ranking is based on an average (combined) life expectancy of males and females. The average life expectancy both in Canada and the United States is higher.

From the Statistical Yearbook: 1976, United Nations, pp. 79-83.

HOW WEATHLY?

COUNTRY	AVERAGE YEARLY INCOME PER PERSON
1. Yemen	$ 129
2. Japan	$3,753
3. Bolivia	$ 201
4. Venezuela	$1,567
5. Bhutan	$ 47
6. United States	$6,189
7. Mali	$ 54
8. Switzerland	$6,387
9. Gabon	$1,391
10. Kuwait	$8,042
11. Mexico	$ 883
12. Greece	$1,811

From the Statistical Yearbook: 1976, United Nations, pp. 639-643.

NATIONS: WHERE DO PEOPLE LIVE?

A module for teaching high school students about the reasons for urban population growth around the world with the aid of quantitative concepts.

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

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This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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2. Scatter Diagram--Relationship between Health (life expectancy) and Urbanization in Seven World Regions, 1978.
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4. High, Medium, and Low Countries for Health (Life Expectancy) in Six World Regions, 1978.
5. High, Medium, and Low Countries for Wealth (GNP per capita) in six World Regions, 1978.
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WHERE DO PEOPLE LIVE?

OVERVIEW OF THE MODULE

Introduction

Throughout history people have migrated from countryside to city, largely in response to opportunities in the city. Urbanization has served as an index of industrialization and modernization. The transformation of human society from primarily rural to one that is primarily urban has been particularly rapid in the twentieth century. By the year 2000, the proportion of the world's population in urban areas is expected to triple from 20 to 60 percent. This growth will continue to put immense pressure on policy planners to meet the social and economic needs of urban residents.

In this module, we will examine some of the forces that influence people's decision to migrate from rural to urban areas around the world. This will be done by examining two variables, health and wealth, and relating these to the degree of urbanization found in various world regions and nations. In general, a positive relationship between urbanization and the two variables is evident, but teachers should stress that variations among nations do take place and explore these variations with their students.

Description of Materials

Courses and Topics:

World History: Population distribution, rural to urban migration, and global urbanization.

Current Social Problems: Urban problems and prospects.

Grade Level: 9-12.

Time Required: Two class periods.

Concepts and Skills:

Social Studies Concepts: Health, wealth, and urbanization.

Quantitative Concepts: Correlation and scatter diagrams.

Thinking Skills: Comparing and interpreting.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Identify the correlation between urbanization and health among world regions, using percent urban and life expectancy as indicators.
2. Identify the correlation between urbanization and wealth among world regions, using percent urban and GNP per capita as indicators.
3. Discuss the factors which may affect urban population growth around the world.
4. Construct scatter diagrams as a means of identifying the correlation between urbanization and the two variables, health and wealth, among individual nations.
5. Understand that a relationship based on a large number of nations may provide a general pattern within which there will be variation among individual nations.

Sources of Data:

The 1978 edition of the World Population Data Sheet is the major source of data for this module. The Data Sheet is published annually by the Population Reference Bureau, Inc., P.O. Box 35012, Washington, D.C. 20013.

LESSON 1: GLOBAL URBANIZATION

Introducing the Lesson

1. To introduce this module, show students "Degrees of Urbanization" (Student Materials #1). Photograph A represents a rural area, B is a small town, C is a medium sized, clean city (or suburb), and D is a large, industrialized city.

2. As the students consider the photographs, they can begin to think about the degree to which health and wealth are related to urbanization by responding to the following questions:

   --Which place would offer the greatest variety and number of job opportunities? Why?

   --At which of the four places would you be likely to make the most money? Why?

   --Which would offer the best in social services, including welfare, child care, or education? Why?

   --At which place would you expect to have the easiest access to doctors? Hospitals? Why?

   --At which place would you expect to live the longest? Why?

NOTE: Make sure that you probe the reasons for student responses to each of the questions. For example, many students might expect to live the longest in a rural area, away from the hurried, noisy, polluted life of the city. Yet, limited access to doctors and hospitals might have a detrimental affect on the health and life span of those living in rural areas. Now, explain that each kind of place represented on the photographs may be found in nearly every country in the world; however, the percentage of the population living in each kind of place varies from country to country. Ask the students to shift their focus from the individual places shown in the photographs to nations with different degrees of urbanization. Write the following on the chalkboard:

Country A	10% Urban	90% Rural
Country B	50% Urban	50% Rural
Country C	80% Urban	20% Rural

Then, have the students consider the same questions as those above. Have any of their answers or reasons changed? If so, why?

Developing the Lesson

3. Explain to students that even though global population growth is very rapid, the growth in urban areas is even more rapid.

NOTE: According to the urban estimates published by the U.N. in 1978, population in urban areas of more than 20,000 inhabitants increased from 752 million in 1960 to nearly 2 billion in 1975. The big city figure--the figure where the vast concentrations of people are to be found--is even more startling. Big cities grew about two and a half times in the developed world but in the developing regions, the increase has been more than eight-fold.

Point out that despite hazards such as pollution, congestion, and increased stress levels, people still keep pouring into the urban areas not only in this country but all over the world. Possible reasons for this drift to the cities include:

--Declining opportunities due to land and population pressures in the rural areas.

--A revolution of rising expectations.

--Government expenditures on urban areas at the expense of the rural areas.

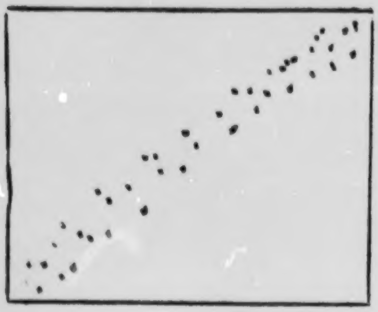
--The greater availability of basic social and educational services in the urban areas.

4. Explain to students that the remainder of this module will be spent testing the accuracy of people's perception that better opportunities are available in the urbanized areas. This will be done by selecting two variables (health and wealth) and looking closely at the degree to which they are associated with urban population. One method for judging this association is available through "Scatter Diagram - Relationship between Health and Urbanization in Seven World Regions, 1978" (Student Materials #2) and "Scatter Diagram - Relationship between Wealth and Urbanization in Seven World Regions, 1978"(Student Materials #3).

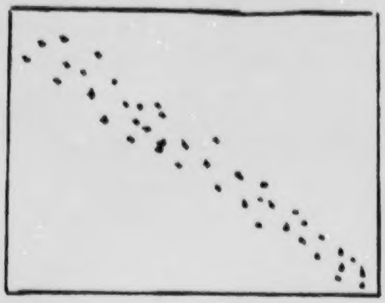
NOTE: Before using the student materials you might wish to discuss scatter diagrams with the students.

A SCATTER DIAGRAM is a tool used by social scientists to help them judge how closely two variables correspond. A variable is something that varies in value from case to case or time to time. For example, a measure of wealth will vary between nations and will vary between two points in time for the same nation. If there is a close POSITIVE CORRELATION between the variables, the scatter diagram will form a pattern which resembles figure A. If there is a close NEGATIVE CORRELATION, the scatter diagram will form a pattern which resembles Figure B. If there is little CORRELATION between the variables, the scatter diagram will not form a pattern but will assume a random distribution as in figure C.

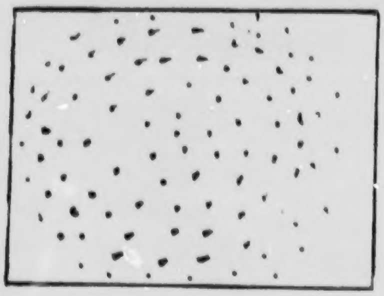
A



B



C



It is important to indicate that correlation does not necessarily mean causality. Several items may exhibit a high positive correlation without having a causal relationship. For example, ice cream sales at the beach and number of drownings have a high positive correlation but neither one causes the other. Rather, both correlate highly with a third variable--temperature--which may be a causal factor.

5. Now, distribute Student Materials #2 and Student Materials #3. Elicit student response to the diagrams in the Student Materials through the following questions:

--Does there appear to be any correlation between urbanization and health in the world regions? Yes. If so, is it positive or negative? Positive.

--What does a positive correlation mean in terms of the specific variables? If the degree of urbanization is high, health, as measured by life expectancy , will also be high.

--Are there any regions which significantly differ from this pattern? Yes. If so, which region(s) and why? Southeast Asia and Africa, to a certain extent. In these regions recent advances in the treatment of disease have reached those living in the rural areas more rapidly than is common.

--Does there appear to be any correlation between urbanization and wealth in the world regions? Yes. If so, is it positive or negative? Positive.

--What does a positive correlation mean in terms of the specific variables? If the degree of urbanization is high, wealth, as measured by GNP per capita, is also likely to be high.

GNP per capita is the region's total output of goods and services divided by the total population of the region.

--Are there any regions which significantly differ from this pattern? Yes. If so, which region(s) and why? Latin America, where poor conditions in the countryside have forced people to migrate into large urban areas looking for job opportunitites.

6. At this point suggest a need to be cautious in identifying relationships. For instance, we have used life expectancy at birth as an indicator of health and GNP per capita as an indicator of wealth. If mental illness and unemployment were used as indicators of health and wealth respectively, the relationship between these variables and urbanization could be different and might be negative. Also, caution is suggested when using the term "urban." For some countries, this may be defined as an area with 100,000+ population. In other countries it may be only 20,000+. Nevertheless, we should still be able to make useful generalizations using the available data.

7. A further test of the association can be carried out by having the students construct two scatter diagrams showing the correlation between health (life expectancy) and urbanization, and between wealth (GNP per capita) and urbanization based on the data from "High, Medium, and Low Countries for Health (Life Expectancy) in Six World Regions, 1978" (Student Materials #4) and "High, Medium and Low Countries for Wealth (GNP per capita) in Six World Regions, 1978" (Student Materials #5).

NOTE: In diagram A, the vertical axis represents percent urban population of each country while the horizontal axis represents life expectancy. In diagram B the vertical axis again represents percent urban population of each country while the horizontal axis represents GNP per capita. In diagram A, the units of measure for both axis should be 10 points each from 0-90. In diagram B, the units of measure should be ten points each from 0-90 on the vertical axis and 1,000 points each from 0-8000 on the horizontal axis.

Example:

Diagram A

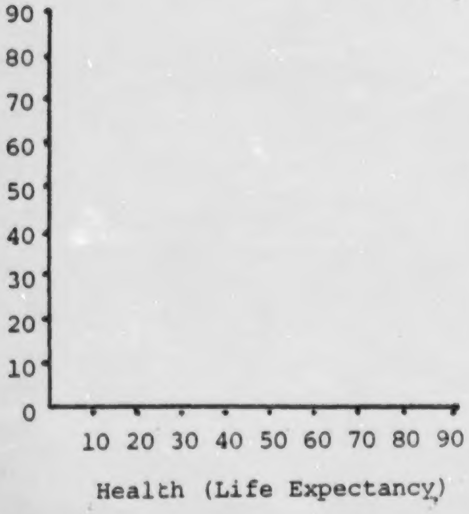
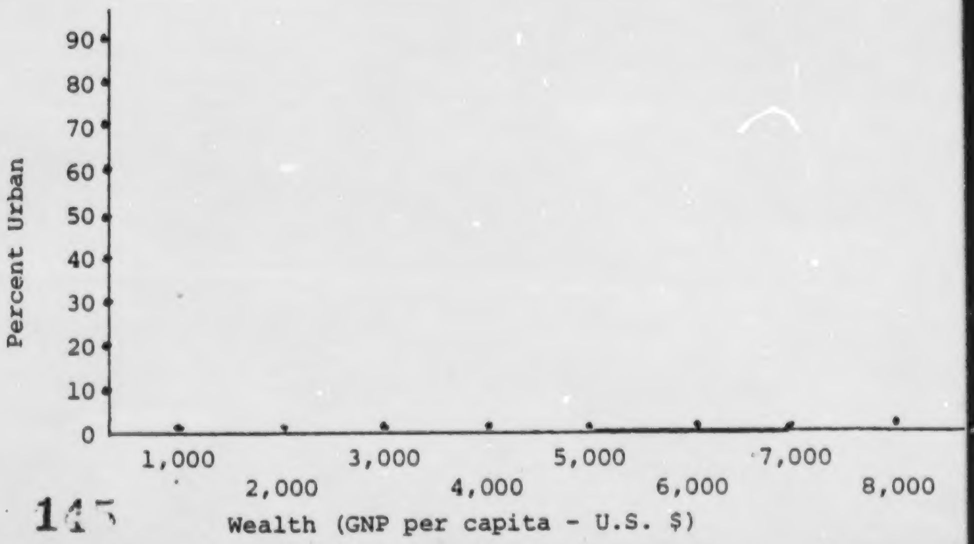


Diagram B



8. Student interpretation of the diagrams should be built around the following questions:

   --Do the diagrams agree with the positive correlation found previously in world regions between urbanization and each of the variables, health and wealth? Yes.

   --Are there any nations that significantly differ from the norm? Yes. Which nations? Kuwait and Libya are wealthy, Middle Eastern oil nations which have a low percentage of urban population.

   --What are the possible implications of this positive correlation for urban population growth in the future? Globally speaking, more people will probably be migrating to urban areas.

Concluding the Lesson

9. Conclude by pointing out that the final part of the lesson will offer students the opportunity to examine further the forces that influence people's decision to migrate from rural to urban areas, and to draw a relationship between rapid urbanization and its effect on urban residents around the world. Distribute "The Individual and Global Urbanization" (Student Materials #6) and ask students to read the four case studies.

10. After the students have finished reading the case studies, conduct a summary discussion focused on the following questions:

    1. Global urbanization seems to be occuring on a widespread basis. As seen through the eyes of the individuals in the case studies, what are the reasons that might account for this drift toward the cities?

    2. Does the list of reasons include the perception that better opportunities for health and wealth are available in the urbanized areas?

    3. Were individual expectations about what urban life has to offer fulfilled? Why or Why not?

    4. What are some of the problems which may result from rapid urbanization?

[illegible]

5. Are these problems now commonly faced in areas throughout the world?

6. How did each of the individuals react to the complexities or urban life?

7. What kinds of institutions and organizations could best solve the problems of rapid urbanization? Local? National? International? Why?

8. What advice do you think Carl Barton might give? Kwame Enugu? Why?

9. Suggest some approaches which may be used to solve one of the problems identified in question number 4.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. The major quantitative concept empahsized in this module is CORRELATION. From the diagrams presented in Student Materials #2 and #3, students should notice that there is a POSITIVE CORRELATION between urbanization and the two variables, health and wealth, in the seven world regions.

2. As the module continues, students are asked to test the correlation between urbanization and the two variables by constructing scatter diagrams using data from selected countries within six world regions. This exercise should again clearly illustrate positive correlation with only a few nations showing significant differences from the norm.

3. There are two precautions that should be stressed throughout the module. We used indicators such as life expectancy and GNP per capita to represent the variables, health and wealth. These indicators correlated positively with urbanization. If other indicators were used, such as mental illness and unemployment rates, the relationship between the two variables and urbanization might differ.

4. Rapid urbanization brings about a set of problems which every world region now seems to face in common. These problems will continue to put immense pressure on societies to meet the social and economic needs of urban residents.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Ask students to identify the one place in the world where they would like to live and support their choice with three to five reasons. If possible, locate each student's choice on a world map large enough for every student to see. How close are the students choices to large urban areas? Have the students look again at the reasons behind their choice and discuss why people might wish to live in large urban areas. Why are well known cities - like New York, London, Tokyo, Paris, Singapore located where they are?

2. If you live in or near a large city, call the public relations department of the city and request an urban planner to come out and speak to your class. The speaker should be qualified to discuss settlement patterns, current problems to urban life, and possible future directions for your city.

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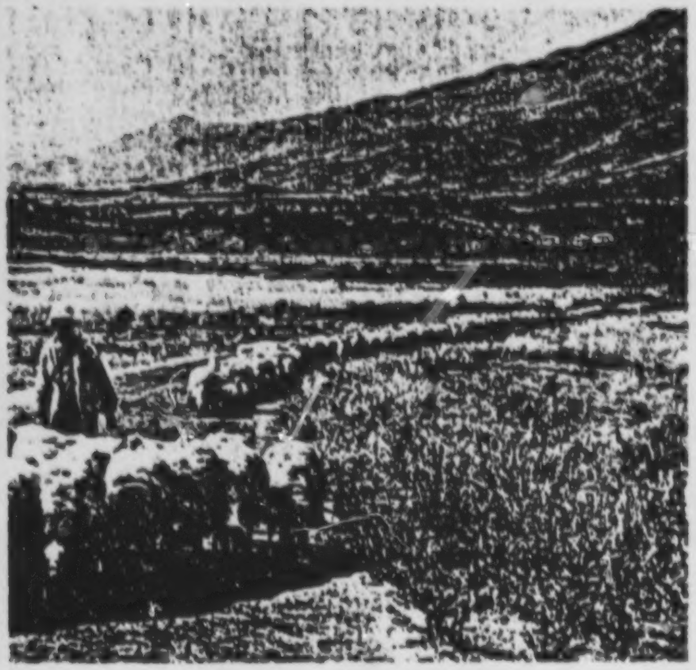
WHERE DO PEOPLE LIVE? STUDENT MATERIALS #1

DEGREES OF URBANIZATION



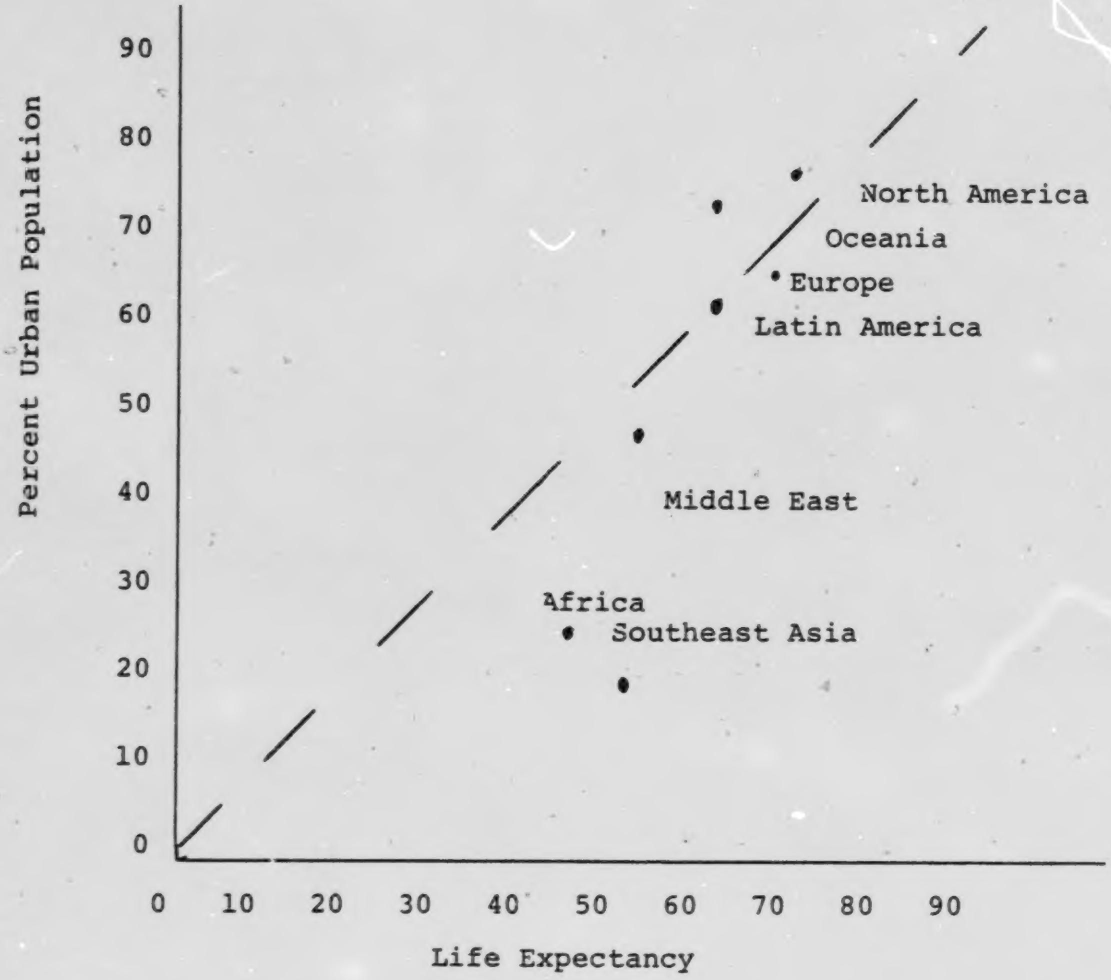
A RURAL AREAS

B SMALL TOWNS

C MEDIUM SIZED CITIES (SUBURBS)

D LARGE INDUSTRIAL CITIES

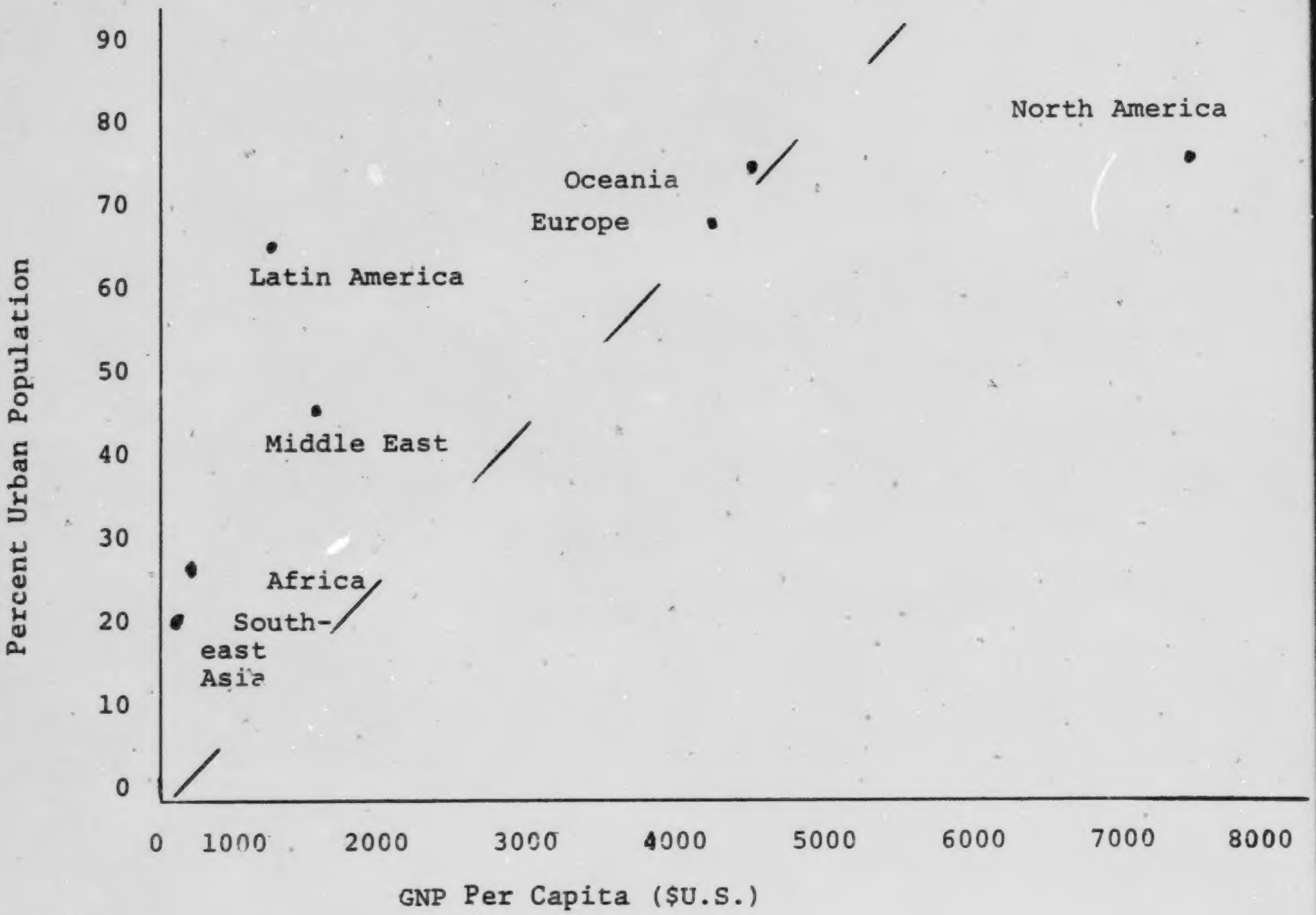
SCATTER DIAGRAM - RELATIONSHIP BETWEEN HEALTH AND URBANIZATION IN 7 WORLD REGIONS, 1978



Region	% Urban Population	Life Expectancy at Birth
North America	74	73
Latin America	61	62
Europe	65	71
Middle East	45	55
Africa	25	46
Oceania	71	68
Southeast Asia	21	52

Source: Population Reference Bureau, World Population Data Sheet, 1978.

SCATTER DIAGRAM - RELATIONSHIP BETWEEN WEALTH AND URBANIZATION IN 7 WORLD REGIONS, 1978



Region	% Urban Population	GNP per capita (U.S.)
North America	74	7,510
Latin America	61	1,100
Europe	65	4,420
Middle East	45	1,730
Africa	25	440
Oceania	71	4,730
Southeast Asia	21	330

Source: Population Reference Bureau, World Population Data Sheet, 1978.

HIGH, MEDIUM, and LOW COUNTRIES FOR HEALTH IN SIX WORLD REGIONS, 1978

Region	Range	Country	Life Expectancy at Birth	% Urban Pop.
1. North America	High	Canada	73	76
	Low	U.S.	72	74
2. Latin America	High	Uruguay	69	83
	Medium	Brazil	61	60
	Low	Bolivia	48	34
3. Europe	High	Sweden	75	83
	Medium	USSR	69	62
	Low	Yugoslavia	68	39
4. Middle East	High	Israel	73	86
	Medium	Turkey	57	45
	Low	Yemen	45	21
5. Africa	High	Tunisia	55	50
	Medium	Liberia	45	28
	Low	Angola	38	18
6. Southeast Asia	High	Singapore	71	100
	Medium	Philippines	58	32
	Low	Afghanistan	40	15

Source: Population Reference Bureau, World Population Data Sheet, 1978.

HIGH, MEDIUM, AND LOW COUNTRIES FOR WEALTH IN SIX WORLD REGIONS, 1978

Region	Range	Country	GNP Per Capita (U.S.)	% Urban Population
1. North America	High	U.S.	7,890	74
	Low	Canada	7,510	76
2. Latin America	High	Venezuela	2,570	75
	Medium	Brazil	1,140	60
	Low	Bolivia	390	34
3. Europe	High	Sweden	8,670	83
	Medium	Czechoslovakia	3,840	67
	Low	Albania	540	34
4. Middle East	High	Kuwait	15,480	56
	Medium	Israel	3,920	86
	Low	Yemen	265	21
5. Southeast Asia	High	Singapore	2,700	100
	Medium	Malaysia	860	27
	Low	Nepal	120	4
6. Africa	High	Libya	6,310	30
	Medium	Congo	520	40
	Low	Ethiopia	100	12

Source: Population Reference Bureau, World Population Data Sheet, 1978.

PERCENT URBAN, LIFE EXPECTANCY, AND GNP PER CAPITA FOR COUNTRIES WITHIN TWO SELECTED REGIONS; LATIN AMERICA AND EUROPE, 1974

A. Region - Latin America

Country	% Urban Population	Life Expectancy at Birth	GNP Per Capita($U.S.)
Argentina	81	68	$1,250
Bolivia	35	47	200
Brazil	58	61	750
Chile	76	63	780
Colombia	64	61	410
Costa Rica	41	69	780
Ecuador	39	60	370
El Salvador	39	58	340
Guatemala	34	53	450
Mexico	61	63	870
Nicaragua	49	53	500
Panama	49	66	900
Paraguay	38	62	400
Peru	60	56	620
Uruguay	80	70	860
Venzuela	75	65	1,360
Cuba	60	70	540
Dominican Republic	40	58	510
Jamica	37	68	870

B. Region - Europe

Country	% Urban Population	Life Expectancy at Birth	GNP Per Capita ($U.S.
Albania	34	71	460
Austria	52	71	3,710
Belgium	87	71	4,690
Bulgaria	59	72	1,590
Czechoslovakia	56	70	2,870
Denmark	80	73	5,340
Finland	58	69	3,660
France	70	73	4,850
West Germany	88	71	5,620
East Germany	75	71	3,000

Country	% Urban Population	Life Expectancy at Birth	GNP per Capita ($U.S.
Hungary	49	70	$1,850
Italy	53	72	2,520
Norway	45	74	4,740
Poland	55	70	2,090
Portugal	26	68	1,310
Spain	61	72	1,730
Sweden	81	75	6,160
USSR	60	70	2,300
United Kingdom	76	72	3,120
Yugoslavia	39	68	1,100

Source: World Population Data Sheet, 1975

The Individual and Global Urbanization - Four Cases

Case #1--Kenichi Morita

Kenichi Morita, 37, lives in Tokyo--the world's largest, noisiest, and most congested city. He works for a large, downtown advertising firm and is considered to be a promising young executive. Kenichi came to Tokyo nearly 20 years ago to get a university education and then to start on a business career. Thousands of young Japanese like Kenichi still flock to Tokyo each year because it is a place where the rewards for talent and ambition are greatest. For Kenichi, living and working in Tokyo means that he earns an average income twice that of the national average and three times that earned in remote farm regions. Tokyo is also the most important center of almost every aspect of Japanese life--politics, industry, transportation, theatre, and the other arts. But, Kenichi wonders whether the benefits are worth the risks. Recently he has not felt well. Severe headaches and worry have kept him awake at night. Although the medical facilities are excellent, Kenichi has decided that Tokyo is not a healthful place to live, neither for himself nor his family. Pollution, lack of sanitation, inadequate housing, and noise are the major health hazards cited by Kenichi. Moreover, Tokyo's population is increasing by 250,000 each year and the city can not provide basic services fast enough for the ever growing demands. Kenichi knows that he must soon make up his mind whether to stay in Tokyo or look for a job elsewhere.

Case #2--Kwame Enugu

Kwame Enugu, 29, is an underemployed carpenter who lives in a wooden hut he built 3 years ago in a slum suburb on the fringe of Lagos, the capital of Nigeria. Like hundreds of thousands of other immigrants from the bush, Kwame arrived in the city determined to make the wrenching change from the tribal way of life to city ways and the modern economy. In a good month, Kwame can find odd jobs and errands which bring in the equivalent of $25. He also grows vegetables which his wife sells in the local market for a little money. From that he must support his wife and three children. To save on transportation, Kwame walks every day to an affluent district of the city to look for job's but often he returns frustrated because work is unavailable. Despite this and other drawbacks to living in the slums--no schools, no sewers, no running water or electricity--Kwame does not want to return to his tribal village. Even in normal times, Kwame and his family do not eat well but there is not the visible hunger that exists in the cities of India, Pakistan, and some areas of Africa. "At least we can feel a little free here," he explained. "In the village it is always trouble with the old people, and there are no jobs, no hospitals, no roads. There is nothing in the bush, nothing."

Case #3--Arnaldo Cavalcanti

After the floods struck the rural areas of Northeast Brazil, Arnaldo Cavalcanti, a tenant farmer, decided to give up farming and move with his wife and four children to Sao Paulo, Brazil's largest industrial city. While living in a favela (slum) in the center of Sao Paulo, Arnaldo struggled to support his family. Recently, he was evicted from the slum area in order to make room for an office and apartment block which, as a matter of fact, is still not constructed. Arnaldo temporarily moved his family in with relatives while continuing to look for employment, but his relatives can hardly accomodate their own immediate family, let alone Arnaldo and his family. In a desperate mood, Arnaldo gathered with a group of 200 other poor Brazilians on the outskirts of Sao Paulo. Arnaldo and his friends had been planning for some three weeks to seize and settle on a large barren piece of land outside the city. A large company owns the land and has plans to construct a factory on it. For some reason the factory had not been built and Arnaldo marched with his friends to the tract of land and began "building" a new settlement. The government, under pressure from the landowner, sent two hundred riot police to regain the land. At first the government troops attempted to peacefully remove Arnaldo and his friends. Finally, force was used and fifteen squatters, including Arnaldo, were killed and the land returned to the company.

Case #4--Carl Barton

Carl Barton grew up in Chicago, Illinois. He always considered himself a "city boy." While he was growing up, Carl often used to go downtown on the train to shop and simply "hang around." Carl loved the fast train ride, and he loved to watch all the people while wandering through the stores. He thought you could find anything you wanted in those stores. As he grew older, his interests turned more toward sports. Carl's favorite summer activity during junior high school was going to watch the Chicago Cubs play baseball. He didn't always have enough money to buy a ticket, so he often had to sneak into the ballpark.

Later, when he was in high school, Carl started driving, and he was more able than ever to take advantage of the city, going to football games, rock concerts, movies, and other activities. Then, it was time for high school graduation. Carl was not sure what he wanted to do--go in the service, get a job, go to college. He finally decided to take some time off to travel and think about his future. He had only been out of Chicago three times to visit his cousin in Toldeo, Ohio, so this would be a good opportunity for him to see what the rest of the country was like. His travels gave Carl a new view of the United States. He had always looked at the U.S. through the eyes of a city dweller. Now he discovered the wide open spaces that were written about in his history books. Carl enjoyed the slower pace in the small towns he visited. He camped in the forests of northern Wisconsin, the mountains of Colorado, and along the rivers of Oregon. He tried backpacking, crosscountry skiing, and even kayaking. It was amazing to Carl that he had always been happy living in the city while he was missing all these enjoyable experiences. After two years Carl returned to Chicago. Had it really changed, or was he the one who had changed? The air was dirty, the streets and the neighborhoods were crowded, there was no way to escape the noise. That was the moment Carl decided that he was no longer a city boy. Now you can find Carl Barton living in a small cabin near Rutland, Vermont. He misses big league professional sports and he sometimes gets lonely, but Carl claims that the life of a country boy is healthier and happier than that of a city boy.

AROUND THE GLOBE:
FREEDOM AND QUALITY OF LIFE

A module for teaching secondary
students about political freedom
and quality of life with the aid
of quantitative concepts.

Project QUESST
Boulder, Colorado
August, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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OVERVIEW OF THE MODULE

Introduction

Among the nations of the world, which nations' people enjoy the greatest degree of freedom and the highest quality of life? How may we compare differences and similarities among the world's many nations? What indicators or types of data would help us to compare more accurately? This module explores these questions and focuses on some of the limitations of data commonly used to make cross-national comparisons. This module also introduces students to concepts used in comparisons, including range, indicator, and index numbers.

When studying different nations, students frequently make comparisons between those nations. If they are to describe and compare accurately, it is useful to learn some basic comparative techniques. This module focuses on the comparison of political freedoms and general quality of life among nations.

Description of Materials

Courses and Topics:

World History: Quality of life and political freedom.

Current Social Problems: Quality of life and political freedom.

Grade Level:

7-9: Basic activity.

10-12: With suggested activities for advanced students, the starred (**) items.

Time Required: Two or three class periods.

Concepts and Skills:

Social Studies Concepts: Political freedom and quality of life.

Quantitative Concepts: Numbers (index and indicator) and range.

Thinking Skills: Comparing and inferring.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Identify indicators which help describe and compare political freedom and quality of life.
2. Use an index to describe and compare such social science concepts as political freedom and quality of life.
3. Identify strengths and weaknesses of an index.
4. Discuss the relationship of political freedom and quality of life.

Sources of Data:

1. The Physical Quality of Life Index, developed by the Overseas Development Council, 1717 Massachusetts, N.W., Washington, D.C., was the source of information on quality of life presented in this module.
2. The Political Freedom Index, developed by the Freedom House, 20 W. 40th Street, New York, was the source of information on political freedom presented in this module.

LESSON 1: COMPARING NATIONS

Introducing the Lesson

1. Explain to students that in this lesson they will be discussing freedom. Ask them for brief definitions of freedom and write these on the chalkboard. Do not spend much time on this since the lesson will return to this point later. You might also ask students to speculate on ways in which they think freedom can be measured. Later they will be considering how closely the degree of freedom in a place is related to that place's quality of life.

2. Introduce "A Measure of Freedom" (Student Materials #1). In small groups, have students read the four cases and mark the degree of freedom that they believe exists (on a 1-5) scale in each case. After deciding upon the degree of freedom depicted by each example, students should attempt to define "freedom" more completely.

3. For each of the four cases, allow a representative of each student group to report the freedom score (from much freedom, 1, to little freedom, 5) that their group assigned to the cases. Also, have students read their definition of freedom.

4. Discuss briefly students' reasons for assigning the scores to each of the four cases. Points which could be covered include:

   --How many cases received a score of 3 or higher, depicting an average to high degree of freedom?

   --Were the kinds of freedoms in question in each case of a similar type? No. What different kinds of freedom were depicted? Protecting Life and School's Out are examples of freedom of expression and the right to due process under the law. Freely Elected is an example of the freedom of political choice. Finally, Observed is an example of freedom of assembly and freedom of religion.

   --Were your reasons based on sufficient information? If not, what additional kinds of information would you like to have for each case before deciding on a freedom score?

5. Allow students to brainstorm a list of components or aspects of freedom, in this case, political freedom. The definitions generated by Student Materials #1 should help students. The list of aspects of political freedom might include:

   --Freedom of assembly

   --Freedom of speech and press

   --Right to due process under law

   --Representative government and free elections

   --Civilian control of military forces

   --Freedom from discrimination based on age, sex, race, religion, and ethnicity.

6. Encourage students to list these aspects in terms of things they are able to do in the U.S. which they might not be able to do in a nation that had a great many restrictions on political freedom. Their responses might include points such as the following:

   --Being able to complain about government policies or practices

   --Being able to talk to or write to government officials

   --Being able to vote

   --Having a jury trial if they are accused of a crime

   --Being able to live where they want

   If students have difficulty thinking of conditions in a nation with serious restrictions on political freedom, you may wish to prepare a bulletin board of current news headlines describing conditions in such nations.

   NOTE: Have students record and keep this list for use later in the lesson.

Developing the Lesson

7. Ask students to consider how the degree of political freedom in a country might affect the way people live in that country. The following questions may help stimulate discussion:

   --If you were thinking of living in another country, how would the degree of freedom in different countries influence your decision about where to live? Most likely, students will suggest that they would prefer to live in a country with a high degree of freedom.

   --Do you think people are "better-off" in countries with much or little political freedom? (Give some reasons for your answers.) This question should initiate a consideration of what things are important in defining and measuring quality of life. Try to keep track of all the factors mentioned by students.

   --How can we decide how "good" a place is for living? This question will allow students to speculate about possible indicators of quality of life. Spend only a brief time on this point since it will be treated more completely later.

8. Use "Why Would Anyone Live In Boston?" (Student Materials #2) to help students think about the concept of quality of life and introduce them to the concepts of indicator and index. You may have them read the materials individually, or you may go through them with the class in a lecture-discussion.

9. At this point, the terms INDICATOR and INDEX should be defined again for students.

   --An indicator is something which indicates or illustrates a larger, more complex whole. For example, high quality of food and competitive price are indicators of good restaurants, a strong backhand is one indicator of a good tennis player, and average income per person is one common indicator of the general wealth of a nation.

   --An index is a composite rating (frequently 0-100) based upon two or more indicators. For example, the U.S. Consumer Price Index is based upon a large number of indicators. In this case, each indicator is the average price of some consumer item, such as poultry, gasoline, and shoes.

10. The students now have some working definitions of freedom and quality of life. Explain that they will be looking at how these two characteristics vary from nation to nation and how closely they seem to be related. Distribute "Comparing Nations" (Student Materials #3) and have students complete the quiz questions.

11. Lead a brief discussion of the correct answers. Answers to Student Materials #3 are:

    --Of the six nations listed in question 1, all six scored 100 (on a 0–100 scale) on the political freedom index developed by a private organization, in New York, named Freedom House. These scores were compiled in 1977.

    --Of the six nations listed in question 2, all rank low on the political freedom index. Cambodia scored a zero. The U.S.S.R. and the other four nations all scored only an eight on the 0–100 scale.

    --Of the six nations listed in question 3, the U.S.A. is among those nations ranking high on the physical quality of life index developed by a private organization, in Washington, named the Overseas Development Council. However, only the U.S.S.R., with a score of 91, ranks lower than the U.S.A., with its score of 94. Sweden, with a score of 97, ranks the highest in the world on the physical quality of life index. Other scores include Iceland--96, Japan--96, and Switzerland--95.

    --Of the six nations listed in question 4, the lowest physical quality of life standards are reported for Ethiopia--with a score of 19 out of a possible 100. Other nations' scores include Saudi Arabia--28, India--43, Turkey--55, Peru--59, and Angola--15.

12. Ask students which indicators they think might have been used to develop the Political Freedom Index and the Physical Quality of Life Index. List these indicators on the chalkboard and ask students to indicate ways in which each might be measured. Then explain that:

--The Physical Quality of Life Index, developed by the Overseas Development Council, reported in Student Materials #2 is composed of three indicators. Each nation of the world was scored for its literacy rate, infant mortality rate, and life expectancy rate.

--The Political Freedom Index, developed by Freedom House, reported in Student Materials #2 is also a composite rating based upon indicators of nations' respect for the civil and political rights of citizens.

13. Distribute and have students review briefly "Regions of the World" (Student Materials #4). In five small groups, have students identify the range of each index for a geographic region, and post the answers on the chalkboard. The range is the amount of difference between the high and low nations on an index. In effect, the range establishes the boundaries of an index for a geographic area. The ranges for the five geographic areas are provided in an answer sheet--Supplementary Teacher Materials #1.

14. Discuss the two indices by geographic region. From the answers on the chalkboard, students should be able to state that:

--The range of political freedoms varies, but does not vary greatly, between geographic regions. In the Americas, Asia, and Europe the range of the index covers all or most of the 0-100 scale. In Africa and the Middle East, the range of the index covers 3/4 or more of the 0-100 scale.

--The range of the political freedom index indicates that the nations of the Americas, Asia, and Europe range from very free nations (e.g., Canada, Australia, and Denmark) to very unfree nations (e.g., Cuba, North Korea, and Albania). The nations of Africa and the Middle East range from relatively free nations (e.g., Gambia and Israel) to very unfree nations (e.g., Uganda and Iraq).

--Looking at the individual scores of nations in the student materials indicates that, both in Africa and the Middle East, most nations fall under 50 on the 0-100 scale. In Europe, there is a noticeable difference between communist and non-communist nations. In the Americas and Asia the nations are more evenly spread along the 0-100 scale.

--The range of the physical quality of life varies more by geographic region than does political freedom. In Africa the range covers the lower end of the 0–100 scale whereas in Europe the range covers the upper end of the scale. In the Americas, Asia, and the Middle East, the range covers the top 2/3 of the 0–100 scale.

--The range of the physical quality of life index indicates that the nations of the Americas, Asia, and the Middle East range from a moderately low quality of life (e.g., Bolivia, Afganistan, and Yemen) to high quality of life standards (e.g., Canada, Japan, and Israel). The nations of Africa range from a low to moderately low quality of life. European nations, on the other hand, all cluster at the high end of the scale.

--Looking at the range sets the boundaries or limits of an index for a given geographic region. However, where individual nations fall or cluster within the range is important information which will help to better describe nations. For example, with regard to political freedom, it is important to know that though the range of the index is 0–100 in Europe, communist nations are clustered toward the bottom of the scale whereas non-communist nations are clustered toward the top of the scale.

Other categories of clusters by nations would also be interesting to explore. Such categories could include communist--non-communist nations and developed--developing nations. The March 13, 1978 edition of Time magazine is a useful source of information.

15. At this point, the concept of using an index should be reviewed with students. Again emphasize that an index is a score based on the combined scores of two or more indicators. Points to be emphasized include:

--One strength of using an index is that it presents one composite score which can be compared between nations. For example, if we wish to compare the physical quality of life between twenty nations of North and South America, it is easier to compare one index number than it would be to compare three separate ratings for literacy, infant mortality, and life expectancy.

--One weakness of an index, it may be argued, is that it is a composite score. Some people argue that a composite score loses some of the detail needed for complete comparison. Others argue that an index may fail to include among its indicators some important factor. For example, it could be argued that a physical quality of life index should include indicators for quality of air and water, daily caloric intake, and cost of medical care. Getting agreement on exactly which indicators to use to construct an index may be a difficult, complex problem.

--A question which always arises in constructing an index is whether or not all indicators should be of equal importance or weight. In building the physical quality of life index, the Overseas Development Council decided that each of the three indicators should be of equal importance. Each nation was assigned a 0-100 score on each of the three indicators. The average (mean) of the three indicators is the physical quality of life index score for a nation.

> It is not uncommon to find that indicators were given different weights or degrees of importance in building an index. For example, in constructing a political freedom index, it might be decided that an indicator of free elections should count for twice as much as an indicator for freedom of the press.

Concluding the Lesson

16. Break students into small groups. Have them take the list of components of political freedom developed in step 4 of the lesson and select three to use as indicators of political freedom in nations around the world. In reporting back to the class, the groups should state:

--Which three aspects of freedom were selected to be indicators of political freedom?

--Why were these three selected to be the indicators?

--Are the three indicators of equal importance? If not, which indicator is more important? How much more important--twice as important, three times as important?

--How can you measure each indicator?

17. Compare the indicators selected by the groups. Upon which indicators was there agreement? Which indicators were not selected by all groups? Have the class decide upon three indicators and the degree of importance to assign to each.

**18. For advanced students or classes, have the students brainstorm a list of aspects of economic development and then select three to be indicators for an economic development index. Measures could include per capita personal income, inflation rate, unemployment rate, level of industrialization, and the dollar amount of foreign exports.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. INDICATOR is something which indicates or illustrates a larger, more complex whole. For example, average life expectancy is one indicator of the physical quality of life in a nation.

2. INDEX is a composite score based on two or more indicators. The primary use of an index is to make it easier to make comparisons.

3. When comparing nations using index scores it is useful to know the range from high score to low, the median (average) score, and the distribution of individual nations within the range.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Have students calculate the average (median) for each index in each geographic region presented in the module. Compare the average between regions. Select a region and compare nations within a region. Which are above average? Which are below average? Speculate why nations rank as they do.

2. Have students investigate their own community, using an index which they have constructed. For example, an index of quality of life using number of parks, number of schools, etc.

3. Use the United Nations Demographic Yearbook and the U.N. Statistical Yearbook to construct an index in order to compare nations of the world.

SUPPLEMENTARY TEACHER
MATERIALS #1
(Answer Sheet)

GEOGRAPHIC REGIONS

Americas

Political Freedom: 100- 8 = a range of 92

Quality of Life: 95-43 = a range of 52

Africa

Political Freedom: 83- 0 = a range of 83

Quality of Life: 48-13 = a range of 35

Asia

Political Freedom: 100- 0 = a range of 100

Quality of Life: 96-18 = a range of 78

Europe

Political Freedom: 100- 0 = a range of 100

Quality of Life: 97-72 = a range of 25

Middle East

Political Freedom: 75- 0 = a range of 75

Quality of Life: 89-27 = a range of 62

A MEASURE OF FREEDOM

Protecting Life

An industrial plant, located near a large city in one of the western states of the U.S., makes both nuclear materials for nuclear power plants and parts for nuclear weapons. A group of citizens thinks that America shouldn't make nuclear weapons and has blocked roads to the plant with pickets. A group of residents from the nearby city feel that the plant should not be near the city where a nuclear accident could kill thousands of people. This group has also picketed the plant, handed leaflets to workers at the plant, and tried to get their Congresswoman to have the plant closed.

Sixty members of the anti-weapons group have been arrested by the county sheriff for stopping delivery trucks and workers from entering the plant. Some people have been arrested two or three times, have paid small fines, or left jail after putting up bail money. These sixty people now have to go to court for trial. The plant charges them with trespassing, creating a disturbance, and interfering with the plant's workers' rights to get to work. The defendants argue that protecting life is a "higher right."

How much freedom do you think is allowed in the society described above? (Circle one answer from 1 to 5.)

Much Freedom 1 2 3 4 5 Little Freedom

School's Out

A school principal in a large high school in an eastern city has just expelled two seniors for cheating on their final exam in calculus. This means that both students could fail to graduate with their class next month. Both students deny that they were cheating. Their teacher is sure that he saw them talking during the exam and passing a note. The students deny passing a note but admit they talked--but only to exchange a calculator.

How much freedom do you think is allowed by the school authorities described above? (Circle one answer from 1 to 5).

Much Freedom 1 2 3 4 5 Little Freedom

Freely Elected

A nation has just held an election. The newly elected president got 90% of the vote. Almost 99% of the people voted. Only those too sick to leave home or those in jail failed to vote. Election day is a holiday--all factories, stores, offices, and restaurants are required by law to close. A citizen who fails to vote may be fined one week's wages.

How much freedom do you think is allowed in the society described above? (Circle one answer from 1 to 5).

Much Freedom 1 2 3 4 5 Little Freedom

Observed

The Constitution guarantees freedom of religion, but they watch us all of the time. On Sunday they are always there--taking down the names of all who enter the church. Sometimes they follow us to see who we talk to, to see who our friends are. At work they ask other workers if I talk to them about religion. They ask if I try to spread religious propaganda. Always, I am observed.

How much freedom is allowed by the society described above? (Circle one answer from 1 to 5).

Much Freedom 1 2 3 4 5 Little Freedom

Freedom

How would your group define "freedom"? What is meant by the term? Try to write a one sentence definition of the term.

WHY WOULD ANYONE LIVE IN BOSTON?

Karen and Ed are brother and sister. They are both thinking about moving away from home after graduating from high school. Karen wants to go to college. Ed wants some time to "sort things out" before deciding what to do. Karen has decided that New England--maybe Boston--would be the best place for her while Ed thinks that he will head for Jackson Hole, Wyoming.

Karen and Ed are like many people, trying to decide where they want to live. They have been asking themselves questions such as:

--In what kind of community do I want to live?

--What things are important in making a community a "good" place to live?

--How can I measure how "good" the living is in a particular community?

--How can I compare different places to decide which is a better (or the best) place to live?

One way to help answer these questions is to use an INDEX. An index is a number which helps in making comparisons among different things. Several different things might be considered in developing an index which can be used to compare what we might call the "quality of life" in different places. We will look at this in a minute.

Karen and Ed were talking one night about how they had decided on where they wanted to live. Karen wanted a place near a large city with many cultural advantages--for example, museums, theaters, restaurants, concerts. She also wanted a "high quality" university to attend. Also, she wanted to be near recreational opportunities--sailing in the summer and skiing in the winter. Boston fit all of these requirements. Ed, on the other hand, wanted a place to "get away from it all." Jackson Hole is near Yellowstone and Grand Tetons National Parks. He can do lots of hiking and skiing, but still will need to earn a living. Since Jackson Hole is a tourist town, Ed hopes to get a job related to his outdoor interests--as a jeep driver for scenic mountain drives or as a guide with a wilderness outfitter.

The things that Karen and Ed considered in making their comparisons and decisions might be called INDICATORS. Quality of life is a very broad idea and includes many parts.

The parts (indicators) of quality of life that are important to Ed and Karen are:

Karen

1. Cultural institutions
2. Educational facilities
3. Recreational opportunities

Ed

1. Outdoor recreational opportunities
2. Employment opportunities

An indicator, then, is one part of a very broad or complex idea which may be used to tell us something about that broader idea. In other words, for Karen if the cultural institutions in a place are good, that is one indicator for her of a good quality of life.

Now, lets return to the idea of an index. We can use the indicators that we have talked about to develop an index for quality of life. The index will be one number which summarizes how well a place rates with respect to all of these indicators. Here is how Karen and Ed might rate Boston and Jackson Hole on a scale of one to four for each of the five indicators:

1 = poor
2 = adequate
3 = good
4 = excellent

	Boston	Jackson Hole
Cultural	4	1
Educational	4	1
Recreational	3	4
Outdoor	2	4
Employment	3	3
Total	16	13

We now have one number to use in comparing the quality of life in Boston and Jackson Hole. Even though it got a lower score, Ed still thinks that Jackson Hole is the better place to live. This raises another point about developing an index. Some indicators may be more important than others. Ed, for example, sees outdoor recreational activities as the single most important indicator of quality of life. One way to deal with this problem is to assign different weight (degrees of importance) to each indicator. So, Ed and Karen agreed that the availability of cultural institutions and outdoor recreation should be weighted (counted as more important) more than the other indicators. They decided to give each indicator a weight of:

Cultural - - - - - - - - - - - - 8

Educational - - - - - - - - - - 3

Recreational - - - - - - - - - - 3

Outdoor Recreation - - - - - - 8

Employment - - - - - - - - - - - 3

If you multiply these weights by the previous scores for each indicator, the results are:

	Boston	Jackson Hole
Cultural	(8x4) = 32	(8x1) = 8
Educational	(3x4) = 12	(3x1) = 3
Recreational	(3x3) = 9	(3x4) = 12
Outdoors	(8x2) = 16	(8x4) = 32
Employment	(3x3) = 9	(3x3) = 9
Total	78	64

A perfect score would be 100. Many indexes use 0--100 as a range because it makes comparisons easier.

Now, you have a good idea of how to develop and compute an index. The steps are:

1. Identify a broad, complex idea that you wish to compare from place to place or time to time. For example, you can compare the quality of life in your community and another community, and you can compare the quality of life in your community today and ten years ago.

2. Identify several important aspects of the broad idea which could serve as indicators. (What are some additional indicators of quality of life?)

3. Assign a weight to each indicators to reflect its degree of importance in the index.

4. Figure out some way to measure each indicator--this is often a very difficult step--and assign it a score.

5. Combine the weighted scores for the indicators to obtain the index number.

Oh, by the way, Ed is still convinced that Jackson Hole has a higher quality of life than Boston. He claims that he and Karen have to rethink their indicators and maybe agree on a new weighting system.

COMPARING NATIONS

Place a check mark in front of the name of the country BEST DESCRIBED by each statement.

1. Of ALL the countries in the world, my citizens enjoy the greatest degree of political freedom.

________COSTA RICA

________U.S.A.

________AUSTRIA

________NORWAY

________AUSTRALIA

________CANADA

2. Of the countries listed below, my citizens have the least political freedom.

________CUBA

________AFGANISTAN

________LIBYA

________CZECHOSLOVAKIA

________U.S.S.R.

________CAMBODIA

3. Of ALL the countries in the world, my citizens enjoy the highest physical quality of life standards

________SWEDEN

________ICELAND

________SWITZERLAND

________JAPAN

________U.S.A.

________U.S.S.R.

4. Of the countries listed below, my citizens have the lowest physical quality of life standards.

________TURKEY

________PERU

________ANGOLA

________INDIA

________SAUDI ARABIA

________ETHIOPIA

REGIONS OF THE WORLD

Political Freedom--Physical Quality of Life

Region/Nation	Freedom Rating	Quality of Life
AMERICAS		
Argentina	17	85
Bolivia	33	43
Brazil	42	67
Canada	100	95
Chile	17	77
Colombia	75	68
Costa Rica	100	85
Cuba	8	84
Dominican Republic	67	64
Ecuador	33	67
El Salvador	67	64
Guatemala	50	51
Honduras	42	51
Mexico	50	73
Nicaragua	33	53
Panama	25	80
Paraguay	25	73
Uruguay	17	87
U.S.A.	100	94
Venezuela	92	79
AFRICA		
Algeria	17	41
Angola	0	15
Botswana	75	45
Burundi	8	22
Cameroon	25	25
Central African Republic	0	18
Chad	8	18
Congo	8	26
Ethiopia	0	19
Gabon	17	21
Gambia	83	25
Ghana	25	34
Guinea	0	20
Ivory Coast	25	28
Kenya	33	39
Liberia	33	26
Libya	8	44

Region/Nation	Freedom Rating	Quality of Life
AFRICA (cont'd)		
Lesotto	42	48
Madagascar	33	41
Malawi	8	30
Mali	0	14
Mauritania	17	14
Morocco	58	40
Mozambique	0	24
Niger	8	13
Nigeria	42	25
Rhodesia	25	43
Rwanda	17	25
Senegal	50	24
Sierra Leone	33	27
Somalia	0	19
South Africa	25	48
Sudan	25	35
Tanzania	17	27
Togo	8	25
Tunisia	25	47
Uganda	0	34
Upper Volta	42	16
Zaire	8	28
Zambia	33	30
ASIA		
Afghanistan	8	18
Australia	100	93
Bangladesh	33	35
Bhutan	50	N.A.
Burma	8	51
Cambodia	0	40
China	17	57
India	83	43
Indonesia	33	48
Japan	92	96
Korea (North)	0	N.A.
Korea (South)	33	82
Laos	0	29
Malaysia	58	62
Nepal	25	25
New Zealand	100	94
Pakistan	33	38

Region/Nation	Freedom Rating	Quality of Life
ASIA (cont'd)		
Philippines	33	71
Taiwan	42	86
Thailand	25	68
EUROPE		
Albania	0	72
Austria	100	93
Belgium	100	93
Bulgaria	0	91
Czechoslovakia	8	93
Denmark	100	96
Finland	83	94
France	100	94
Germany (East)	0	93
Germany (West)	100	93
Greece	83	88
Hungary	25	91
Ireland	100	93
Italy	92	92
Netherlands	100	96
Norway	100	96
Poland	25	91
Portugal	83	78
Rumania	8	90
Spain	83	91
Sweden	100	97
Switzerland	100	95
United Kingdom	100	94
Yugoslavia	25	84
MIDDLE EAST		
Egypt	42	42
Iran	25	44
Iraq	0	39
Israel	75	89
Jordan	17	47
Kuwait	33	74
Lebanon	50	79
Qatar	33	31
Saudi Arabia	17	28
Syria	25	54
Turkey	75	55
Yemen (North)	25	27
Yemen (South)	0	27

Cluster II

WORLD POPULATION: GROWING, GROWING, GONE?

A module for teaching high
school students about world population
growth and its impact with the aid
of quantitative concepts.

Project QUESST
Boulder, Colorado
September, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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OVERVIEW OF THE MODULE

Introduction

At last count, more than 74 million individuals were being added to the world's population annually. World population has doubled in the past 35 years and is expected to double again by the end of the century. What causes such a massive increase in numbers? How can population be measured? What are some of the factors underlying the expansion of world population? What are the social implications of continued rapid increases in the growth rate?

This module will seek to explore the answers to these questions, answers which are necessary to develop the knowledge base needed to deal with the realities, issues, and problems presented to us by population growth. In this sense the module should be seen only as an introduction to the complexities of population growth. Further exploration of this complex issue and its relationship to students' lives is provided for in the Additional Activities section of this module.

Description of Materials

Courses and Topics:

World History: World population growth.

World Geography: Regional differences in population growth rates.

Current Social Problems: Implications of exponential population growth.

Grade Level:

7-9: Basic activities.

10-12: With suggested activities for advanced students, the starred (**) items.

Time Required:

Two class periods.

Concepts and Skills:

Social Studies Concepts: Population growth.

Quantitative Concepts: Average (median), numbers, and graphs (line).

Thinking Skills: Inferring, comparing, and predicting.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Explain the concept of exponential growth.
2. Identify the population growth formula and explain population doubling time.
3. Compute and compare the median population growth rate and doubling time for separate regions of the world.
4. Explain the birth/death rate impact on population growth.

Sources of Data:

The 1978 edition of the World Population Data Sheet is the major source of data for this module. The Data Sheet is published annually by the Population Reference Bureau, Inc., P.O. Box 35012, Washington, D.C. 20013.

LESSON 1: WHO IS GROWING? WHO IS NOT?

Introducing the Lesson

1. Use a simple five minute classroom exercise to introduce the idea of exponential growth. The exercise will require at least 32 students, but with a larger area, 64 students could be accommodated. Assuming 32 students, however, rope off or set off with chairs about one-half of the classroom space.

2. Ask all students but one to remain outside the enclosed area. Announce to the class that after 60 seconds, the student inside the area will symbolically "give birth" to another student by pulling that student from the outside to the inside area. Then after another 60 seconds, each of the two students now in the enclosed area will pull in or "give birth" to another student for a total of four. Every 60 seconds continue this procedure for doubling the number of students until the enclosed area is completely filled in. As the students are filling up the area, point out that, As with this exercise, world population too is doubling. It has doubled in the past 35 years and is expected to double again by the turn of the century.

NOTE: As students move into the enclosed area they should fill up one side of the allotted space and leave the other side empty until they can no longer do so.

3. After the third minute, ask students in the enclosed area if they feel that space is running out (probably not since over 80% of the space is still empty). Ask the same question after four minutes (maybe, but still unlikely since the space is still half empty). During the fifth and last mintue of the exercise, explain to students that when population doubles, it causes exponential growth.

Most people are accustomed to thinking of growth as a linear process. A quantity is growing linearly when it increases by a constant amount in a constant time period. For example, a child who becomes one inch taller each year is growing linearly. If a person saves $10 each year, his savings is also increasing in a linear way. A quantity exhibits exponential growth when it increases by a constant percentage of the whole in a constant time period. For each student in the enclosed area, for example, after one minute there will be two students, after the next minute there will be four students, then eight, then sixteen. The amount added to the area is not constant. It continually increases, as the total accumulated amount increases. In this particular exercise the growth rate is 100% each period. But exponential rates can also be 50%, 20%, etc. The chart below illustrates what happens to the total number when an exponential growth of 20% takes place:

Period:	1	2	3	4	5	6	7
Total Number	100	120	144	173	207	249	299
Percent Increase	–	20	20	20	20	20	20
Number Increase	–	20	24	29	36	42	50

4. Indicate that exponential growth is especially troublesome because it leads people to a sense of security similar to student feelings about the amount of space available in the enclosed area. As with world population growth, the growth in the number of students in the area goes along apparently harmlessly until the fifth minute. By the end of the fifth minute, however, when doubling occurs again, the space should be completely filled. Elicit student estimates about world population trends based on this exercise, and list these estimates on the chalkboard.

Developing the Lesson

5. Distribute "Growth of World Population" (Student Materials #1). Compare the graph with student estimates of future world population trends.

--What are the major similarities and differences?

--Does world population seem to be growing exponentially? Yes.

--If so, when did the world enter the rapid growth phase of exponential progression? Somewhere around 1700.

6. At this point in the module it is important to emphasize that world population will continue to grow substantially during the students' lifetime. The table presented in "Exponential Growth Data on World Population" (Student Materials #2) can be used to support this position. Ask students:

--Is there any relationship between growth rate and doubling time? Yes. If so, what? If the growth rate increases, the number of years it takes to double the population decreases. If the growth rate decreases, the number of years it takes to double the population increases.

--What trends can be observed in the relationship between world population growth and doubling time over the past century? Until recently, the growth rate has increased while the doubling time has decreased. Since 1974 the growth rate has decreased while the doubling time has increased.

NOTE: Be sure to point out that even if world population growth continues to decrease at the present rate, it is still expected to reach 6,223 million by the year 2000.

The relationship between population growth and doubling time may be summarized as follows:

If population increases by 1% per year, it will take 70 years to double the original number. At 2% the number will double in 35 years. At 2.5% it will double in 28 years, etc. In other words, by dividing the number 70 by the growth rate, you can determine a population's doubling time (this formula is substantially correct as long as the growth rates are under 10%).

Example: In 1974 the Philippines had a popula- of 42.7 million and was growing at the rate of 3.0% per year. How many years would it take to double the population?

70 ÷ growth rate of 3% = 23 and 1/3 years. At current growth rates the population of the Philippines by 1997 would be 85.4 million people.

It should be noted further that the doubling time in years is an approximation only. If we employed the actual mathematical theorem to compute doubling time, it would compare as follows:

Growth Rate	70 ÷ Growth Rate (Estimated Doubling Time)	Actual Doubling Time
1%	70	69.7
2	35	35.0
5	14	14.2
10	7	7.3
20	3.5	3.8

7. Follow up this observation with the data from "Growth Rate and Doubling Time--104 Nations Grouped by Region, 1978" (Student Materials #3) and ask the students to total the number of countries in the world that will have doubled their population by the time the student is 30 years old? 40? 50? 70?

8. Continuing with the module, explain to students that a fuller understanding of the implications of world population growth cannot be reached without examining regional differences in the population growth rate. In some countries, the U.S. for instance, population growth has leveled off recently and is not a serious threat to internal stability as it is in some other countries.

9. To examine regional differences break the students into small groups and assign each group a geographic region using the data from "Growth Rate and Doubling Time" (Student Materials #3). Have each group calculate the MEDIAN growth rate and MEDIAN doubling time for their region and report their findings to the rest of the class.

> MEDIAN is the midpoint of a distribution of scores or a set of numbers. By using MEDIAN as a measure of average, we will not be able to determine the exact population growth rate and doubling time for each geographical region. It is, however, the best measure of typicalness or average we can use for this exercise because it is not as affected by differences in the growth rate and doubling time of countries with unequal populations.
>
> The MEDIAN population growth rate and doubling time for each region in Student Materials #3 is the point where half of the growth rates and doubling times in each country are above and half are below.

--Thus, for example, if we distributed from top to bottom the growth rates and doubling times for countries in the Middle East, the MEDIAN growth rate would be 3.0% and the MEDIAN doubling time would be 23 years.

Middle East

Country	Population Growth Rate (%)	Time to Double Population (Years)
Kuwait	3.9	~~18~~
Jordan	3.4	20
Iraq	3.4	20
Lebanon	3.1	22
Syria	3.1	22
Iran	3.0	22
Saudi Arabia	3.0 -Median=3.0%	23 -Median=23 years
Yemen, Arab Republic	3.0	23
Yemen, People's Dem. Republic	3.0	23
Egypt	2.5	28
Turkey	2.3	30
Israel	2.1	33
Cyprus	1.0	69

--The MEDIAN is not always one of the scores in the distribution, as it was in the previous table. If, for example, we have an even number of countries such as in East and Southeast Asia, the MEDIAN growth rate would be approximately 2.35% and the doubling time would be 29.5 years. The point where half the growth rates and doubling times are above and half are below. Note that with an even number of cases the mid-point or median falls between two cases or countries.

Asia

Country	Population Growth Rate (%)	Time to Double Population (Years)
Pakistan	3.0	23
Mongolia	2.7	26
Bangladesh	2.7	26
Malaysia	2.7	26
Afghanistan	2.6	27
Philippines	2.5	28
North Korea	2.5	28
Burma	2.4	29
Laos	2.4	29
Indonesia	2.4	29
	Median=2.35%	Median=29.5 years
Thailand	2.3	30
Nepal	2.3	30
Vietnam	2.2	32
India	2.0	35
Sri Lanka	1.7	41
South Korea	1.7	41
Taiwan	1.7	41
China	1.4	50
Singapore	1.4	50
Japan	1.0	69

NOTE: For the difference between MEDIAN and other measures of average, see the module, "What Americans Earn."

10. With a world population growth rate of 1.7% and a doubling time of 41 years as a reference, ask students the following set of questions:

--Which regions are above the world growth rate? Latin America (2.8), Middle East (3.0), Africa (2.7), and East and Southeast Asia (2.35).

--Which regions are below? North America (.75), Europe (.5), and Oceania (.9).

--Which regions have a doubling time below that of the world figure? Latin America (25 years), Middle East (23 years), Africa (26 years), and East and Southeast Asia (29.5 years).

--Which regions are above the world figure? North America (96.5 years), Europe (139 years), and Oceania (78 years).

**--Are there countries in each region that significantly differ from the median growth rate? Yes. Which countries? Aregntina, Uruguay, and Cuba in Latin America; Japan, China, and Singapore in East and Southeast Asia; and Cyprus in the Middle East. Why? Argentina and Uruguay have large, urban, Europeanized populations with high literacy rates. Japan and Singapore likewise have populations that are predominantly urban, highly literate, and heavily influenced by Western nations. China, Cuba and Cyprus have strong, centralized governments that are committed to developing and implementing birth control and family planning programs.

**--How might the national concerns of countries with a fast-growing population differ from those with slow growing populations? The fast growers must concentrate on meeting basic needs such as food, clothing, and shelter while attempting to institute programs that will hold down population growth in the future. In the slow growing countries, basic needs may no longer be a problem, and emphasis can be placed upon improving the quality of life and providing opportunities for individuals to achieve goals without external restraints.

**--What impact would continuous rapid population growth in the fast-growing regions have on individual Americans? Increased competition for scarce resources (food, energy, water, etc.) might eventually lead to international conflict over the allocation of these resources.

12. After students have identified the regions which are fastest growing in population and discussed the possible consequences of this growth in the future, focus student attention on "Estimated Birth and Death Rates: 1770–1970" (Student Materials #4).

Point out that the two graphs illustrate a major cause of the difference between the fast-growing and slow-growing regions. Pursue this comparison further by eliciting student response to the following questions:

--Which group of regions does graph A represent, fast-or slow-growers? Slow-growers. Why? Birth rates are declining in direct proportion to death rates.

--Which group of regions does graph B represent? Fast-growers. Why? Birth rates continue to remain high despite a reduction in death rates, thus leading to rapid increases in population growth.

** --If the fast-growing regions are able to lower death rates through application of the latest medical advances, what factors prevent them from lowering the birth rates as well? The fast growing nations are predominantly traditional agricultural societies where it is believed that more children can increase the earning potential of the family and the birth of a male is important to the family name. In many of these societies, religious influences have restricted the flow of birth control and family planning information.

Concluding the Lesson

13. The students at this point have been exposed to exponential growth, doubling time, the formulas for population growth, and the major cause of the population explosion in the fast-growing regions of the world. Conclude the module by asking students to read, "Does Anybody Blame Overpopulation" (Student Materials #5). Discuss the key points raised in the article. Some questions might be:

--How would you interpret the "message" of the article?

--Why do you think the author wrote this article? To convince people that overpopulation is a serious problem.

--Is overpopulation a topic for people to get concerned about? Is it really a serious life and death issue?

--Why would the author of this article want to associate overpopulation with death from natural catastrophes? To dramatize overpopulation.

--Do you think the article is effective? Why?

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. MEDIAN (the midpoint of a distribution of scores or a set of numbers) is the major quantitative concept emphasized in this module. While it does not give us the exact population growth rate and doubling time for each geographic region, it is the best measure of typicalness or central tendency we can use for the module because it is not as affected by the differences in growth rate and doubling time of countries with unequal populations.

2. Exponential growth occurs when a quantity increases a constant percentage of the whole in a constant time period. Most people tend to think of growth as a linear process in which a quantity increases by a constant amount in a constant time period. It is useful to think of exponential growth in terms of doubling time or the time it takes a growing quantity to double in size. The doubling time is approximately equal to 70 divided by the growth rate. This means that world population with a growth rate of 1.7% per year is growing exponentially and will doulbe within the next 41 years.

3. A comparison of median growth rates and doubling times for world regions indicates that some regions are growing faster and taking less time to double their population than others. A major cause of the difference between regions is that the slow growers have reduced their birth rates in direct proportion to their death rates while the fast growers have not been able to reduce their birth rates despite a reduction in death rates. In the future, the national concerns and priorities of the fast growers will significantly differ from those of the slow growers. As world population growth continues, increased competition for scarce resources might lead to international conflict between the fast and slow growers.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. This activity can be used interchangeably with the opening activity on exponential growth. Ask students to imagine four people (two married couples) who wish to escape the fast pace of modern society by migrating to a remote and uninhabited island 300 miles off the Atlantic Coast. The island is 16 square miles and assuming no food shipments from the outside, it requires ¼ square mile to support each person on the island with enough food for a year. Through a combination of births and new migration, the population of the island manages to double each year after the first year. In how many years will the island reach its limits in sustaining the food needs of the population? (Answer: 5 years. Again, after the 4th year, the island will have more than enough food to sustain the existing population. In the 5th year, however, as doubling occurs again, the island will have reached its limits.

2. To assist students in understanding how exponential population growth relates to their own lives, refer to another module in this series, "The Energy Crunch and the Numbers Game". This module explores the positive correlation between rising population, energy use, and the demand for scarce natural resources.

3. This activity can be used to teach students what population density really means.* a) Measure off five areas on your classroom floor. Each area should be 36 inches by 72 inches. This is two square yards. This will represent one square mile of land usable for farming, homes, factories, and stores. b) Divide 35 students from the class into the following groups:

9	-	China	(1800 people per cultivated sq. mile)
1	-	U.S.A.	(130 " " " " ")
4	-	India	(700 " " " " ")
2	-	U.S.S.R.	(260 " " " " ")
19	-	Japan	(3700 " " " " ")

*Excerpted from One World booklet, World Affairs Council of Philadelphia.

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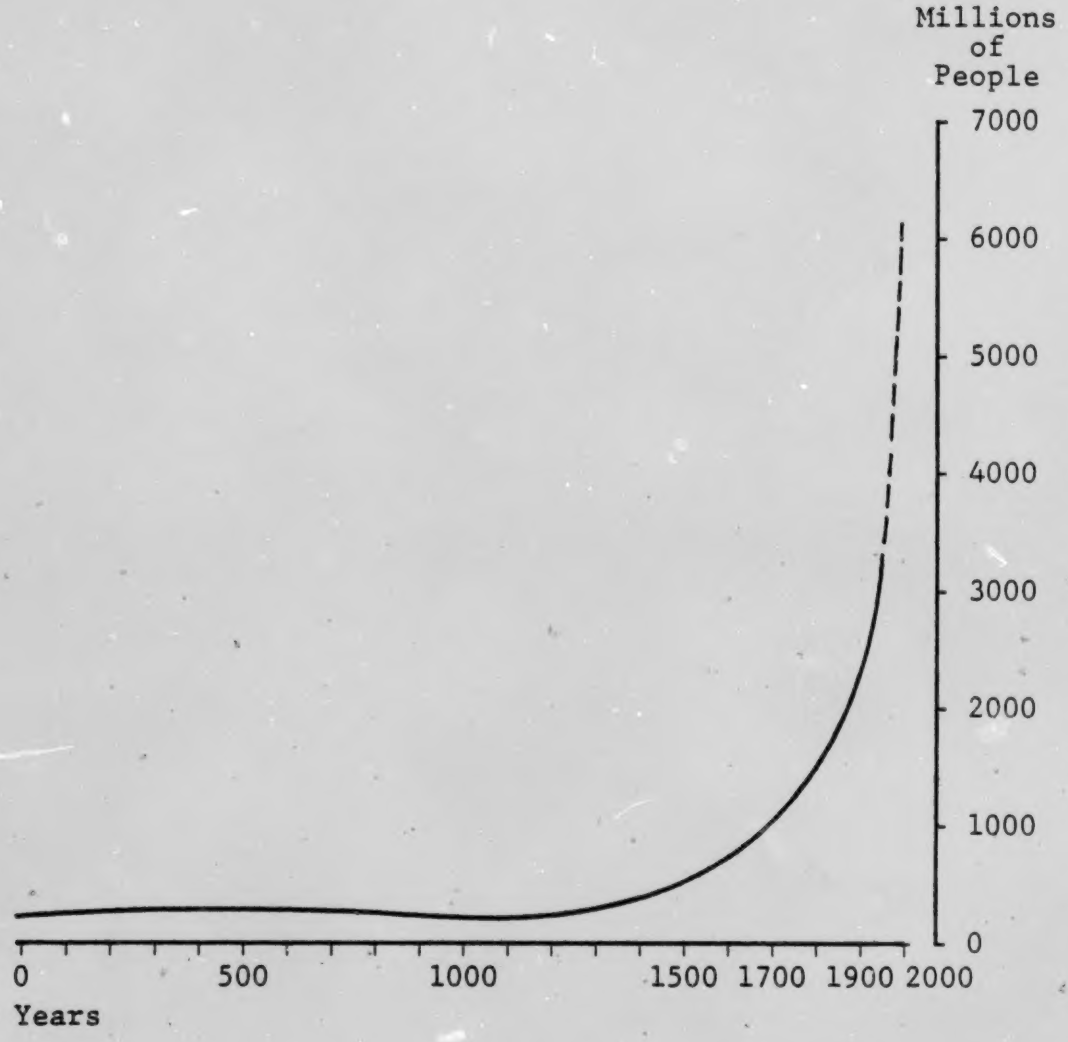
2. Exponential Growth Data on World Population
3. Growth Rate and Doubling Time
4. Estimated Birth and Death Rates
5. Nobody Ever Dies of Overpopulation

c) Each group must stand or sit in its space. Figure out ways to get everybody in--you can use chairs, desks, or anything, but everybody in the group must be in that space--because that's how it is to live in that country. Ask students to think about how difficult it is to share the food from that piece of land with everyone in the room--and to have to live together in peace and harmony besides.

4. Obtain copies of the paperback Limits to Growth (1st report to Club of Rome), and have the students examine the charts and graphs in the book to see how population is related to other variables such as food production and consumption, energy resources and pollution.

5. Explore with students some of the more exotic solutions to relieving the pressures of overpopulation. Some people have suggested that we can look forward to the day when we will populate permanent space stations rotating around the earth. How realistic is this? Would more or fewer resources be needed to support people in these space stations than are now required on earth? What about cities that could be built below the sea? Would the costs of maintaining the population be greater or less than comparable expenses for a city on land? How would this solution affect the availability of food?

GROWTH OF WORLD POPULATION



Source: Graph adapted from data reported in various U.N. publications.

EXPONENTIAL GROWTH DATA ON WORLD POPULATION

YEAR	POPULATION	DOUBLING TIME YRS.	ANNUAL GROWTH RATE (percent)
3 Million BC	415,000	–	–
400,000 BC	1 Million	About 2.5 Million	0.00003
20,000 BC	2.2 Million	About 400,000	0.0002
6,000 BC	5 Million	About 14,000	0.005
⋮	⋮	⋮	⋮
1650 AD	500 Million	–	0.3
1850 AD	1,000 Million	200	0.5
1930 AD	2,000 Million	80	0.8
1974 AD	3,860 Million	45	2.0
1978 AD	4,219 Million	41	1.7

Source: Table adapted from data reported in various publications of the United Nations and the U.S. Census Bureau.

GROWTH RATE AND DOUBLING TIME

104 NATIONS GROUPED BY REGIONS, 1978

World Population Growth Rate = 1.7%

Time to Double Population = 41 years

Region: North America

Median Growth Rate ________

Median Doubling Time __________

	Population Growth Rate (%)	Time to Double Population (Years)
United States	0.6	116
Canada	0.9	77

Region: Latin America

Median Growth Rate ________

Median Doubling Time __________

	Population Growth Rate (%)	Time to Double Population (Years)
Argentina	1.3	53
Bolivia	2.9	24
Brazil	2.8	25
Chile	1.8	38
Colombia	2.4	29
Costa Rica	2.4	29
Cuba	1.5	46
Dominican Republic	3.0	23
Ecuador	3.2	22
El Salvador	3.3	21
Guatemala	3.1	22
Haiti	2.2	32
Honduras	3.5	20
Jamaica	2.3	30
Mexico	3.4	20
Nicaragua	3.4	20
Panama	2.6	27
Paraguay	3.1	22
Peru	2.9	24
Uruguay	1.1	63
Venezuela	3.0	23

Region: Europe	Median Growth Rate	Median Doubling Time
Belgium	0	-
Denmark	0.2	347
France	0.3	61
West Germany	-0.2	-
East Germany	-0.3	-
Greece	0.8	87
Italy	0.4	173
Portugal	0.9	77
Norway	0.3	231
United Kingdom	0	-
Bulgaria	0.6	116
Czechoslovakia	0.8	87
Hungary	0.5	139
Poland	1.1	63
Romania	1.0	69
U.S.S.R.	0.9	77
Austria	-0.1	-
Spain	1.0	69
Sweden	0.1	693
Yugoslavia	0.9	77
Ireland	1.0	69

Region: Middle East	Median Growth Rate	Median Doubling Time
Egypt	2.5	28
Iran	3.1	22
Iraq	3.4	20
Israel	2.1	33
Jordan	3.4	20
Kuwait	3.9	18
Lebanon	3.1	22
Cyprus	1.0	69
Saudi Arabia	3.0	23
Syria	3.1	22
Yemen, Arab Republic	3.0	23
Yemen, People's Democratic Republic	3.0	23
Turkey	2.3	30

Region: East and Southeast Asia	Median Growth Rate	Median Doubling Time
Afghanistan	2.6	30
Bangladesh	2.7	26
India	2.0	35
Nepal	2.3	29
Pakistan	3.0	23
Sri Lanka	1.7	41
Burma	2.4	29
China	1.4	50
Indonesia	2.4	29
Japan	1.0	69
North Korea	2.5	28
South Korea	1.7	41
Laos	2.4	29
Malaysia	2.5	28
Mongolia	2.7	26
Philippines	2.5	28
Singapore	1.4	50
Taiwan	1.9	36
Thailand	2.3	30
Vietnam	2.2	32

Region: Oceania	Median Growth Rate	Median Doubling Time
Australia	.8	87
New Zealand	1.0	69

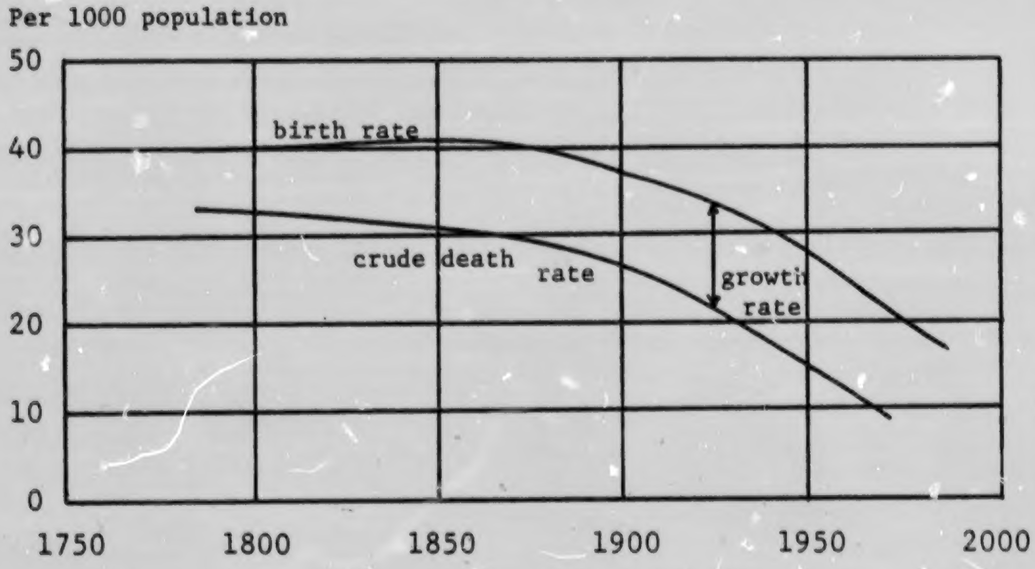
Region: Africa	Median Growth Rate	Median Doubling Time
Algeria	3.4	20
Angola	2.4	30
Cameroon	2.0	38
Chad	2.1	35
Congo	2.6	29
Ethiopia	2.4	30
Ghana	2.9	26
Guinea	2.5	29
Ivory Coast	2.6	28
Kenya	3.3	21
Liberia	2.9	24
Libya	3.9	18

	Population Growth Rate (%)	Time to Double Population (Years)
Madagascar	2.5	28
Morocco	3.1	22
Mozambique	2.3	30
Nigeria	2.8	25
Rhodesia	3.5	20
Somalia	2.7	26
South Africa	2.5	28
Sudan	3.1	22
Tanzania	2.5	28
Tunisia	2.3	30
Uganda	3.0	23
Zaire	2.7	26
Zambia	3.1	22

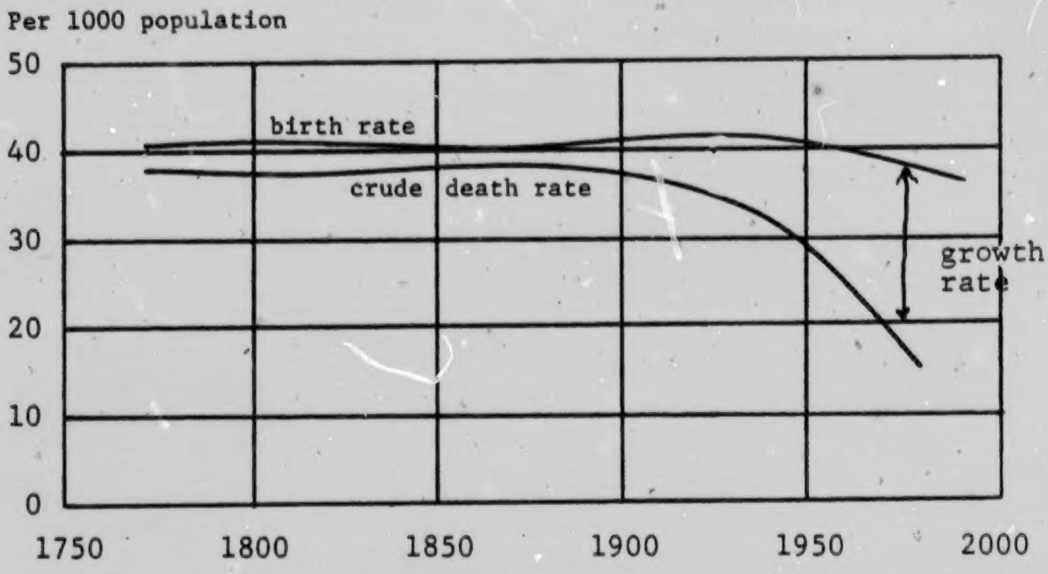
Source: 1978 World Population Data Sheet.

ESTIMATED BIRTH AND DEATH RATES
(1770 - 1970)

A.



B.



Source: Graphs adapted from data reported in various U.N. publications.

DOES ANYBODY EVER BLAME OVERPOPULATION?

If someone disagrees with you, call that person a name! Isn't that the way a lot of people handle disagreement? There are people around, for example, who believe that those who are concerned about the quality of our environment have blown environmental problems way out of proportion. These "ecofreaks," as their critics label them, see DDT in every tree, oil slicks in every bay of the ocean, and deadly levels of carbon monoxide in every breath of air we breathe.

The ecofreaks point out that pollution contributes to cancer, that much of our food is contaminated with chemicals, and that we are exhausting our earth's resources. They see the multiple causes of these problems everywhere. But do the ecofreaks ever blame overpopulation? Lets look at how easy it is to ignore a "cause" of serious problems.

In Peru, when an earthquake struck mountain villages in 1973, early reports spoke of 25,000 dead but the estimates rapidly escalated to 1,000,000 and then dropped back to 300,000. This will do as well as any, for the true figures will never be known. The ones who died remain nameless, people of little importance who left no trace of their existence. With an annual population growth rate of nearly 3.0%, Peruvian parents replaced the lost population in less than 5 months and the world soon turned its attention to other matters.

How did these unfortunate people die? The earthquake, newspapers said. But can one just as logically say that overpopulation killed them? Peru has a geographic location and geological formation that makes it highly prone to earthquakes. In the Peruvian mountains, earthquakes occur every few years and kill several thousand people. If the barrios of the capital city, Lima, were less crowded, no sane man would allow his family to live in the mountains. Geologically speaking, the mountains are disaster areas and humans obtrude there at their own risk.

Is our choice sometimes biased so that we are not forced to confront unwelcome truths? For example, if we were to identify overpopulation as the cause of 300,000 deaths, we would then have to decide how to restrict population growth without turning to distasteful measures of control. Are we afraid, and do we therefore close our minds to a long list of possibilities? Sure, it is easier to say to say that an earthquake caused the deaths; this relieves human responsibility for this and future castastrophies.

Each year millions of people die from diseases with such exotic names as rickets, beri-beri, goitre, and leprosy. It is well known that all these diseases result from malnutrition and malnutrition is connected with overpopulation. But malnutrition rather than overpopulation is called the "cause of death." Is it that we cannot bear the thought of overpopulation as the chief culprit?

Our air is so foul now that people are dying of respiratory diseases because of growing industry necessary to produce the products we "need." We "need" more food and this justifies misuse of the land, leading to "dust bowls," and decreased fish supplies--which lead to greater "needs" for food.

What will we say when there is no more oil and our economy comes to a screeching halt? Will we blame the government? Or the oil companies for not producing enough oil? Or the "ecofreaks" for insisting on pollution controls? One thing is certain: almost nobody will blame the lack of oil on increased demand resulting from rapid population growth. No one ever blames overpopulation. It is unthinkable. Besides, it's easier to call people names!

GLOBAL INTERDEPENDENCE

A module for teaching secondary
students about global interdependence
with the aid of quantitative concepts.

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Student Materials

1. Impacts
2. Effects
3. Connections
4. An Interdependent World
5. Measures of Interdependence

OVERVIEW OF THE MODULE

Introduction

Teachers frequently hear that the world is growing smaller, that global interdependence is increasing, and that we all live on a fragile spaceship earth. How then may we make students aware of the degree to which global interdependence affects their lives? How can students begin to define and measure global interdependence? This module answers these questions and focuses on some common indicators of interdependence between nations. The module also introduces students to concepts used in exploring interdependendence, including indicators, estimation, and reading tables and graphs.

We constantly encounter interdependence in our daily lives. The social studies offer abundant examples of interdependence between people, groups, and nations. As developments in science and technology continue, global interdependence will increase. It is essential, therefore, that students begin to recognize and understand interdependence as a force in world affairs and in their own lives.

Description of Materials

Courses and Topics:

World History: Interdependence and nation states.

Current Issues: Global interdependence.

Grade Level:

7-9 basic activity.

10-12 with suggested activities for advanced students, the starred (**) items.

Time Required: Two class periods.

Concepts and Skills:

Social Studies Concepts: Global interdependence and global relationships.

Quantitative Concepts: Indicators, estimation, tables, and graphs (line).

Thinking Skills: Generalizing, inferring, and predicting.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Define the concept of global interdependence.
2. Identify some common indicators of global interdependence.
3. Estimate future trends of global interdependence based on current data.

Sources of Data:

The 1966, 1970, and 1976 editions of the Statistical Yearbook were the sources of information presented in Student Materials #3 of this module. The Yearbooks are published annually by the United Nations.

LESSON 1: INTERDEPENDENCY

Introducing the Lesson

1. Distribute "Impacts" (Student Materials #1) and have students respond to the degree to which they think that each headline could affect them as individuals and also could have an impact on the United States. For each continuum (scale) they should circle a number (1-5) indicating the degree of perceived impact.

2. For each headline get a class response to the degree of perceived impact on the students and on the nation. For the first question you might put the 1-5 continuum on the chalkboard and record the number of student responses for each 1-5 rating. For the remaining headlines, non-recorded oral responses should be sufficient to get a feeling for the general degree of perceived impact on students and the nation.

3. Divide the class into small groups and distribute "Effects" (Student Materials #2). Allow the groups time to discuss the headlines and answer the questions. Allow each group to report its decisions to the class.

   NOTE: Questions 5 and 6 are more difficult for students because the categories of direct and indirect effects are somewhat ambiguous.

4. Discuss the group answers to the questions in the student materials.

   --Long vs short-term effects. For example, rising oil prices should have a relatively long term effect on the American economy and on students' families ability to drive cars and heat homes. Similarly, a peace accord in the Middle East may have a long term effect on global peace which would lessen the chance of U.S. involvement in war. The Brazilian freeze or the Bolivian strikes, on the other hand, would have relatively short-term effects on the prices of coffee and tin in the United States.

--Direct vs indirect effects. Rising OPEC prices will have a direct, immediate effect on individual Americans and on the nations' economy. The Turkish earthquake would have a direct effect only on an American in the area at the time. The earthquake would have an indirect, small effect on all U.S. taxpayers as some foreign assistance would be provided to help Turkey recover from the quake.

5. Distribute "Connections" (Student Materials #3) and have students complete it as a homework assignment.

Developing the Lesson

6. On the chalkboard, record student responses to the homework assignment. Discuss the meaning of the responses, the degree to which students and their families are connected to other parts of the world.

   NOTE: Questions 1--6 in the homework assignment deal with personal ties whereas questions 7--9 deal with economic ties.

7. Encourage students to brainstorm a list of ways in which the world is interdependent. For example, tourism or world trade. List their ideas on the chalkboard. To stimulate the students, distribute "An Interdependent World" (Student Materials #4) and allow students a few minutes to read it before continuing to add to their list of ways in which the world is interdependent.

8. Note for students that their items may be considered INDICATORS of increasing global interdependency.

   An indicator illustrates a larger, more complex whole. For example, average life expectancy is a common indicator of health, average income is one indicator of wealth, and the volume of world trade is an indicator of global interdependence.

   If you begin to try to categorize the list of student-generated indicators of interdependence, it might include:

--Import and export information, e.g., the total dollar amount of international trade, the proportion of basic raw materials traded between nations, the number of companies engaged in international trade, the annual tonnage of freight shipped between nations, etc.

--Communication information, e.g., the annual number of passengers on international airline flights, the annual number of international phone calls, the average speed of communication and travel, the annual number of foreign newspapers and magazines imported by nations, the annual number of international conferences, etc.

--International organizations, e.g., there are now more than two hundred, including the United Nations, Organization of American States, military groups such as NATO and the Warsaw Pact, economic unions such as the European Economic Community or the Latin American Free Trade Association, the International Monetary Fund, the Organization of African Unity, UNESCO and UNICEF, etc.

9. As a group, try to arrive at a usable definition of interdependence. One dictionary defines interdependence as interaction involving a mutual dependency--parts of some whole relying on each other. How can you make such a definition more meaningful, more useful?

10. At this point, as a class or in small groups, you may wish to have students select those indicators (3--5) which will have the most direct, long-term effect on the United States and answer the following questions.

--Why will the indicator have a direct, long-term effect on the U.S.?

--What will the effect be? How will it influence our economic and social systems?

--What can we as a nation do to change the effect? If we want to change the effect, do you think we can do so? Why?

11. Distribute "Measures of Interdependence" (Student Materials #3) and allow students a few minutes to read it. Note that each data set may be considered one indicator of global interdependence, or at least the interdependence of the U.S. with other nations.

Encourage students to identify any trends indicated by the data. They should be able to identify:

--Steadily increasing tourist travel to the U.S.

--An increasing flow of air mail and air freight.

--A rapid growth of total world trade and of trade between the U.S. and other nations.

--All indicators point to increasing interdependency between nations.

**12. For advanced students or classes, encourage students to ESTIMATE the direction and magnitude of global trends. One logical estimation is that the trends noted in Student Materials #3 will probably continue to increase in the near future at rates similar to those indicated. A global war and a global depression would be two factors which certainly would alter the steady growth of trade and communication between nations. What other estimations can students make concerning global interdependence? Their estimates might include:

> Estimation in this case may be defined for students as the act of using current information to predict approximate future situations where actual counting, measuring, and testing cannot be done.

--Growing dependence of industrial nations (e.g., U.S., Japan, and Germany) on other nations for raw materials (e.g., oil, gas, tin, nickel, and bauxite).

--Continued dependence of certain nations (e.g., third world developing nations) on other nations for manufactured industrial goods and machinery.

--Continued dependence of certain nations on other nations for technology and investment capital.

--Continued increases in travel for pleasure, business, and education.

--Continued increases in communication of all types between nations.

--Continued development of economic organizations such as the European Common Market or OPEC.

--Continued development of international organizations such as the U.N. affiliates, e.g., Universal Postal Union.

Concluding the Lesson

13 . Break the students into small groups. Have each group take an imaginary American their own age and write a future scenario for that person. The scenario could be done at ten-year intervals in the life of the person. The scenario should stress estimations of the degree of involvement of the person in globally interdependent activities. Have the groups share scenarios. If groups are having trouble writing a scenario give them an idea or two, such as:

--As a gift the person receives a Japanese-made t.v. or stereo, French-made 10 speed bike, Austrian-made skis, or German-made camera.

--The person has a class with a foreign exchange student.

--The person writes a pen-pal in another country.

--The person joins the military or a multinational corporation and is stationed overseas.

--The person buys a foreign-made car.

--The person goes to work for a foreign company with offices in the U.S.

--The person begins to car pool due to the dramatic increase in the price of gasoline.

--The person writes to the President to protest the killing of whales by the Russians and the Japanese.

--In tracing his or her historical roots, the person discovers and begins to correspond with relatives in the "old" country.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. INDICATORS such as world trade or tourism rates are valuable social science tools that can help to describe and to compare larger, more complex social realities such as global interdependence.
2. INDICATORS are representative of larger social realities such as global interdependence. There are many indicators which could be selected in most cases. Which indicators we select will in part define and limit the larger social reality. For example, world trade as an indicator focuses on economic aspects of an interdependent world.
3. ESTIMATION is a process of predicting future trends based on current information. Estimation is a common tool used by governments, businesses, and individuals to plan for the future.
4. TABLES and GRAPHS are a useful way of presenting complex information in a concise, readable form.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Have the students do a home inventory of products (e.g., clothes, cars, appliances, and furniture) manufactured in other countries. Categorize results in a table. Table headings could include name of item, country of manufacture, and year purchased.

2. Keep a daily log of the local newspaper for one week. How many items in the news each day indicate global interdependence? How could the news items be categorized? Economic, political, social, and communication might be useful categories.

**3. For advanced students or classes, have students use the U.N. Statistical Yearbook to locate other indicators of global interdependence. Select one or two nations and report on them.

IMPACTS

Listed below are a number of recent headlines from American newspapers. These headlines may or may not reflect global interdependence--the degree to which events around the globe have an effect or impact upon you and upon your country.

Below each headline are two scales (continua). One continuum measures the degree of impact (from 1--very little to 5--very much) the event depicted in the headline could have on you as an individual. The second continuum measures the degree of impact the event could have on the United States as a nation.

For each headline, indicate how much effect or impact the event would have on you and on your country. Indicate your choice by circling a number from 1 to 5 on each continuum.

1. OPEC Nations Raise Oil Prices 10%

   A. Me little impact 1 2 3 4 5 much impact

   B. My Country little impact 1 2 3 4 5 much impact

2. Freeze Strikes Brazilian Coffee Plantations

   A. Me little impact 1 2 3 4 5 much impact

   B. My Country little impact 1 2 3 4 5 much impact

3. Dollar Falls on European Money Markets

   A. Me little impact 1 2 3 4 5 much impact

   B. My Country little impact 1 2 3 4 5 much impact

4. Earthquake Strikes Capital of Turkey

   A. Me little impact 1 2 3 4 5 much impact

   B. My Country little impact 1 2 3 4 5 much impact

5. Strikes Close Bolivian Tin Mines

   A. Me little impact 1 2 3 4 5 much impact

   B. My Country little impact 1 2 3 4 5 much impact

6. Peru declares 200 mile fishing limit

A. Me little impact 1 2 3 4 5 much impact

B. My Country little impact 1 2 3 4 5 much impact

7. Flu Epidemic Strikes Tokyo

A. Me little impact 1 2 3 4 5 much impact

B. My Country little impact 1 2 3 4 5 much impact

8. Chile Declares Martial Law

A. Me little impact 1 2 3 4 5 much impact

B. My Country little impact 1 2 3 4 5 much impact

9. Russia Extends Aid to Vietnam

A. Me little impact 1 2 3 4 5 much impact

B. My Country little impact 1 2 3 4 5 much impact

10. Mexico Discovers New Oil Reserves

A. Me little impact 1 2 3 4 5 much impact

B. My Country little impact 1 2 3 4 5 much impact

11. Growing Pollution On Mediterranean Beaches

A. Me little impact 1 2 3 4 5 much impact

B. My Country little impact 1 2 3 4 5 much impact

12. Middle East Peace Accord Nears

A. Me little impact 1 2 3 4 5 much impact

B. My Country little impact 1 2 3 4 5 much impact

13. More refugees flee Indochina

A. Me little impact 1 2 3 4 5 much impact

B. My Country little impact 1 2 3 4 5 much impact

14. Russian Wheat Harvest Below Expectations

A. Me little impact 1 2 3 4 5 much impact

B. My Country little impact 1 2 3 4 5 much impact

15. Kenya Approves Use of DDT
    A. Me little impact 1 2 3 4 5 much impact
    B. My Country little impact 1 2 3 4 5 much impact
16. U.S.A. and China Establish Diplomatic Relationship
    A. Me little impact 1 2 3 4 5 much impact
    B. My Country little impact 1 2 3 4 5 much impact
17. European Common Market Agrees on New Tariffs
    A. Me little impact 1 2 3 4 5 much impact
    B. My Country little impact 1 2 3 4 5 much impact
18. Strikes in Iran Stop Oil Production
    A. Me little impact 1 2 3 4 5 much impact
    B. My Country little impact 1 2 3 4 5 much impact
19. Japan Agrees To Accept More Imports
    A. Me little impact 1 2 3 4 5 much impact
    B. My Country little impact 1 2 3 4 5 much impact
20. Iceland Threatens Closure of NATO Base
    A. Me little impact 1 2 3 4 5 much impact
    B. My Country little impact 1 2 3 4 5 much impact

EFFECTS

Use the headlines in "IMPACTS" to answer the following questions.

1. Which headline would have the greatest overall impact on the United States? Why?

2. Which headline would have the least overall impact on the United States? Why?

3. Which headlines would have short-term effects on the United States? Why? (a short-term effect is an effect that would last two years or less).

4. Which headlines would have long-term effects on the United States? Why? (a long-term effect is an effect that would last longer than two years).

5. Which headlines would have a direct effect on the United States? Why? (a direct effect is an effect which clearly has an impact on the country).

6. Which headlines would have only an indirect effect on the United States? Why? (an indirect effect is an effect which may have an impact on some Americans but not most Americans or the country as a whole).

CONNECTIONS

1. Do you have relatives in another country that you or members of your family write to? Yes____ No______

   If yes, how many countries ________________________.

2. Do you have relatives in another country who have visited the U.S.? Yes_____ No______

3. Have other members of your immediate family visited another country? Yes_____ No_____

4. Have you visited another country? Yes_____ No_____

   If yes, how many countries _________________________.

5. Do you have newspapers or magazines in your home printed in a language other than English? Yes____ No_____

6. Does anyone in your home listen to radio or television programs in a language other than English? Yes_____ No______

7. Does your family own a car produced by a non-American automobile maker? Yes____ No______

8. Does your family own a t.v., stereo, or camera produced by a non-American company? Yes____ No_________

9. Does any member of your family work for a company that buys from or sells to a company in another country? Yes_____ No_______

AN INTERDEPENDENT WORLD

Economic Interdependence

--By 1980 the international flow of trade between the nations of the world may reach $500 billion a year.

--By 1969 American companies had invested approximately $70 billion in other nations of the world. Today, many oil-rich nations are investing in American companies and U.S. government bonds. In 1970 total foreign investment in the U.S. was estimated to be $13 billion. In 1978 that investment was closer to $60 billion.

--In 1970 only 22 nations in the world had a GNP (gross national product) larger than the gross annual income of General Motors Corporation. Only 25 nations had a larger GNP than Standard Oil. Only 26 nations had a GNP larger than the gross annual income of Ford.

--The European Common Market is planning to have a common currency for all member nations.

--There are now regional economic organizations in East and West Europe, East Africa, Central America, South America, and Asia.

Social Interdependence

--Heroin is imported into the U.S. from many sources, including Turkey, Burma, Thailand, Iraq, Laos, and Afghanistan.

--Large population increases in many developing nations of the world have led to high levels of unemployment which may affect international trade, international peace, foreign aid efforts, and U.N. efforts to achieve social welfare and justice.

--The flow of tourist travel has increased dramatically in the last five years. Growing numbers of foreign visitors are arriving in the U.S. each year.

Resource Interdependence

--In 1970, approximately 35% of produced energy fuels crossed national borders in international trade, with oil leading this increasing trade flow.

--No nation or continent possesses all of the raw materials needed by a modern industrial society.

--Of the 13 basic industrial raw materials required by a modern economy, the U.S. is dependent upon foreign imports for more than one-half of its supplies of eight of these thirteen basic raw materials.

--The average American, each year, consumes approximately 20 times the amount of metallic ores used by the average person in the poorest nations of the world.

Ecological Interdependence

--In many areas of the world, the lack of fresh water limits industrial and agricultural growth. Sudan and Egypt, Israel and Jordan, India and Pakistan, and the U.S. and Mexico have all been involved in disagreements over their nation's share of water from rivers shared by the pairs of countries--the Nile, the Jordan, the Indus, and the Rio Grande.

--Fallout from nuclear tests in China has drifted over Northern America and Europe.

--Air pollution is now a growing problem in every major city in the world.

--Many nations refuse to ban pesticides such as DDT. Development is more important then the environment to them at this time.

--Many Mediterranean beaches in Italy, France, and Spain are now unsafe for swimming due to the polluted waters in that sea.

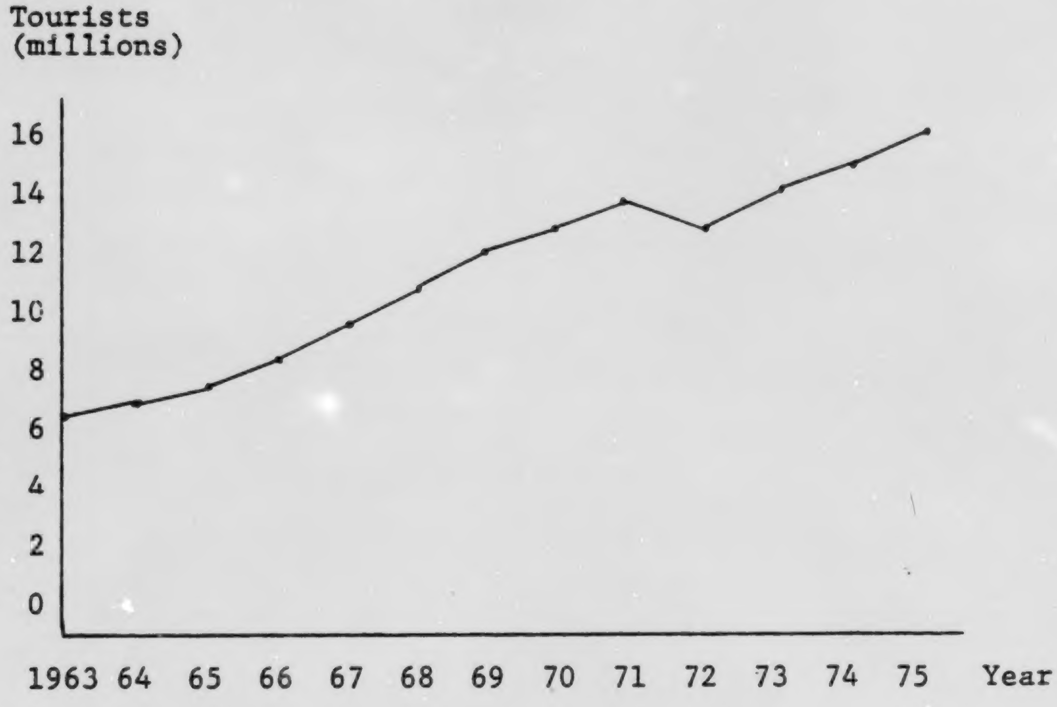
--According to one source, the deteriorating global environment and many human activities have placed 275 species of mammals and 300 species of birds on the endangered species list.

MEASURES OF INTERDEPENDENCE

Transportation and Communication

International trade, tourism, the growing demand for more information of every imaginable sort; all have expanded dramatically as transportation and communication networks have increased and improved. The world is becoming smaller due to increasing speed of travel and communication. For example, until the early 1800s the average speed of travel and communication was 5-10 mph by horse or coach and also 5-10 mph by sailing ship. From the mid-1800s to the turn of the century, steamships averaged 25-30 mph and steam locomotives averaged 65 mph. By the 1950s, propeller aircraft were averaging 300-400 mph. Jet aircraft today average 700+mph. Automobiles today average 55 mph--when obeying the speed limit.

Tourists to the U.S.



Source: U.N. Statistical Yearbooks for the years 1966, 1970, and 1976.

International Air Freight and Mail

(millions of tons)

Year	Air Cargo	Air Mail
1953	149.0 million	46.1 million
1963	429.1	207.2
1973	7,062.1	1,764.9

Air freight and air mail carried on regularly scheduled U.S. airlines on international flights.

Source; U.N. Statistical Yearbooks for the years 1960, 1970, and 1976.

World Trade

(billions of dollars)

Year	U.S. Trade	Total World Trade
1938	$2.1 billion	$25.4 billion
1948	7.1	63.5
1958	13.2	114.5
1968	33.0	252.5

Source: U.N. Statistical Yearbooks for the years 1966, 1970, and 1976.

NATIONS: GUNS OR BUTTER?

A module for teaching high school students about the contrast in world military and social expenditures with the aid of quantitative concepts.

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

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Student Materials

1. Total GNP and Expenditures for Military. Health, and Education - 15 Selected Countries, 1975.
2. Expenditures per Capita for Military, Health, and Education - 15 Selected Countries, 1975.
3. Ranking of Countries from two selected Regions. Africa and the Far East by GNP, Military, and Social Indicators, 1975.

OVERVIEW OF THE MODULE

Introduction

In 1976, world military expenditures reached an average of $1 billion per day. This is an historic high and there is no present sign that the advance will slow down in the future. The expanding supply of arms is more widespread and infinitely more powerful than at any time in history.

Despite this enormous investment of funds in the arms race, social expenditures did manage to increase substantially in the 1960s and 70s. Nevertheless, military and social programs will continue to compete for shares of limited national budgets.

In this module two indicators or types of data are introduced which should help students to contrast military and social spending among the world's nations. The module also introduces students to another concept, rank order, which can be used to make comparisons. By constructing scatter diagrams, they should recognize the correlation between GNP and Military and Social expenditures among individual nations within two selected world regions. In the overall global picture, however, the priority should become clear. No other social objective or official responsibility receives as much financial support from the public budget as the military function.

Description of Materials

Courses and Topics:

Economics:	Effects of military spending, GNP, and expenditures per capita.
Government:	Decision making, priorities, and public expenditures.
Contemporary Issues:	Military conflict and global perspective.

Grade Level: 10-12.

Time Required: Two class periods.

Concepts and Skills:

Social Studies Concepts: Public expenditures.

Quantitative Concepts: Correlation, rank order, and indicators.

Thinking Skills: Comparing, analyzing, and evaluating.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Compare their conception of public expenditures with actual data for 15 selected countries.
2. Distinguish between public expenditures as total amounts and as per capita amounts.
3. Identify the relationship of GNP to public expenditures through the use of scatter diagrams.
4. Discuss their attitude towards military and social spending.
5. Identify the reasons why military spending may be damaging to the economy of a nation.

Sources of Data:

The 1978 edition of World Military and Social Expenditures by Ruth Sivard is the major source of data for this module. The volume deals with expenditures per capita, dominant powers, technology, and spread in the military sector; and comparative priorities, inflation, economic growth, education, health care, and nutrition in the social sector. It is published annually and available from WMSE Publications, Box 1003, Leesburg, Virginia 20075.

LESSON 1: WHO SPENDS WHAT? WHERE?

Introducing the Lesson

1. Students will participate in a card sort to begin this module. Divide the class into four groups. Each group will be given a set of 15 cards on which are printed the names of the following countries:

United Kingdom
China
Japan
Saudi Arabia
United States
Iran
USSR
Brazil
Mexico
West Germany
France
Sweden
Italy
Canada
India

NOTE: Have one group put the cards (nations) in RANK ORDER according to GNP (from highest to lowest), another group do the same with total military expenditures, a third group rank order total expenditures for education, and the final group do total expenditures for health. Rank order is defined as placing items in order from high to low, or, low to high.

2. Clarify for students that:

--Gross National Product (GNP) is the economy's total output of goods and services, valued at current market prices.

--Military expenditures are current and capital expenditures to meet the needs of the armed forces. They include military assistance to foreign countries and the military components of nuclear, space, and research and development expenditures.

--Education expenditures represent current and capital expenditures by governments for public education and subsidized private education for pre-school through university levels.

--Health expenditures represent current and capital expenditures by governments for medical care and other health services.

3. After the groups have completed their rankings, ask them to report their results to the class. Then, ask each group to explain the reasons for their rankings. In particular, the reasons for ranking the highest and lowest country in each group should be thoroughly discussed by the entire class.

4. Distribute "Total GNP and Expenditures for Military, Health, and Education - 15 Selected Countries, 1975" (Student Materials #1). Explain that rank order gives the relative position of the items ranked but does not tell us anything about the absolute difference between items on the list. Thus, the ranking of countries in Student Materials #1 does not denote actual world rank but is used merely to assist students in determining the relative position of each of our 15 selected countries.

5. Next, ask each group to compare their rank order with the ranking as it appears in the handout. Questions to stimulate student participation can include:

--What are the similarities between your rank order and the ranking in the handout? What are the differences?

--Are there any rankings in the handout which surprise you? Which ones? Why?

--Which countries spend the most on military? USSR, U.S., and China.

--Which countries spend the least on military? Sweden, Brazil, Mexico.

--Which countries spend the most on social (health and education spending combined)? U.S., USSR, Japan, and West Germany.

--Which countries spend the least on social? Mexico, India, Iran, and Saudi Arabia.

--Are there any countries that show significant differences in ranking for military as opposed to social expenditures? Yes, Japan is ranked much higher for social spending than it is for military. Iran is ranked much lower for social than for military spending. Student discussion might center on the reasons for the differences in spending priorities of the two nations. For example, Japan is restricted from rearming by the American-imposed Article IX of the Japanese Constitution. Iran, before the Shah's departure, had embarked on an ambitious military spending program with its surplus oil profits.

Developing the Lesson

6. Set aside the data in Student Materials #1 for reference later in the module. Point out to students that total expenditure is one indicator we can use to determine a nation's financial committment to military, health, and education. Inform students that per capita expenditure, or the amount spent per person for each of the three categories, is another indicator.

7. Clarify for students that:

   --Per capita expenditure is the total dollar amount spent divided by the total population to get an average, per person expenditure for the category.

   --Indicator is defined as something which indicates or illustrates a larger whole. For example, whereas total social spending might help to indicate a nations overall commitment to health and education, per capita expenditures may indicate how well-off individuals are with respect to health and education expenditures.

8. To demonstrate the difference between the two types of indicators, distribute "Expenditures Per Capita for Military, Health, and Education - 15 Selected Countries, 1975" (Student Materials #2) and ask students to compare this with the rankings found in Student Materials #1. The following set of questions will help students to investigate the data and make their comparisons.

NOTE: If students cannot answer all the questions, you may have to provide the answers to them.

--Which countries have the highest per capita military expenditures? Why? U.S., USSR, Saudi Arabia. Cold war tensions between Communist block and western nations. Middle East tensions surrounding Israel and the Palestinian question.

--Which countries have the lowest per capita military expenditures? Why? Brazil and India. Both are developing nations with pressing economic problems. India has a serious population growth problem to deal with.

--Which countries have the highest per capita social expenditures? Why? The industrialized, developed nations of the world and the newly-wealthy oil producing nations.

--Which countries have the lowest per capita social expenditures? Why? India, China, Brazil. They are developing nations whose primary emphasis is upon industrialization and agricultural development.

--Comparing the two rankings, expenditures per capita and total expenditures, do they seem to be similar or different? Similar.

--Are there any nations ranked significantly higher for either military or social expenditures per capita, than for total military and social spending? Yes, Sweden and Saudi Arabia.

--Any nations that are ranked lower? Yes, China and USSR.

--Which rank order list do you feel is most useful? Why?

--Can you think of any other measures we might use to indicate a nation's military and social spending patterns? Percentage of GNP by expenditures is another indicator which is commonly used.

Concluding the Lesson

9. Students have now been introduced to rank order and two different indicators of a nation's military and social spending. Conclude this segment of the module by probing student attitudes towards military vs social spending. Ask:

--Assume that a nation's wealth as measured by GNP continues to increase. Should that nation's military spending increase as well? How about social spending?

--If a nation must choose between military and social spending, which should receive higher priority? Why?

--Some Americans feel that it is immoral for the United States to spend so much money on military programs. What role, if any, should moral issues play in deciding national policy?

--Should decreases in military spending necessarily lead to increases in social spending? For example, if the U.S. reduced military spending by 1 billion dollars, where should the money go--social programs? Tax relief? Foreign aid? Development of alternative energy sources?

LESSON 2: SPENDING PRIORITIES: WHAT DETERMINES THEM?

Introducing the Lesson

1. To begin, explain that this lesson will attempt to identify some of the important factors that determine a nation's spending priorities. To do this, have the students refer back to the data in Student Materials #1. Ask students to hypothesize about the CORRELATION between the four categories. Students should be able to hypothesize that there is a strong POSITIVE CORRELATION between GNP and total expenditures for military, health, and education in the 15 countries.

CORRELATION is a statistical term for the relationship of "going-togetherness" between two or more factors. For example, there is a tendency for tall people to weigh more than short people. Thus, there is a POSITIVE CORRELATION between height and weight. When two factors or variables show NEGATIVE CORRELATION, high scores on one "go together" with low scores on the other. For example, as the altitude increases, air pressure decreases. Thus, altitude and air pressure show NEGATIVE CORRELATION. It is important to indicate correlation does not necessarily mean causality. Several items may exhibit a high positive correlation without having a causal relationship. For example, ice cream sales at the beach and number of drownings have a high positive correlation, but neither one causes the other. Rather, both correlate highly with a third variable, temperature, which may be a causal factor.

Developing the Lesson

2. Tell students that we can do an in-depth test of the hypothesis stated in step 1. Divide the class into groups and distribute the data on the "Ranking of Countries from Two Selected Regions, Africa and the Far East, by GNP, Military, and Social Indicators, 1975" (Student Materials #3). Have the students work first with the data presented on the African countries. Explain what a scatter diagram is and have the groups construct a diagram with the vertical axis representing the GNP ranking of each country and the horizontal axis representing the military expenditures

ranking. Follow the same procedure for GNP on the vertical and social expenditures on the horizontal axis.

A scatter diagram is a tool used by social scientists to help them judge how closely two variables CORRESPOND. If there is a close POSITIVE CORRELATION between the variables, the scatter diagram will form a pattern which resembles figure A. If there is a close NEGATIVE CORRELATION, the scatter diagram will form a pattern which resembles Figure B. If there is little CORRELATION between the variables, the scatter diagram will not form a pattern but will assume a random distribution such as Figure C.

FIGURE A

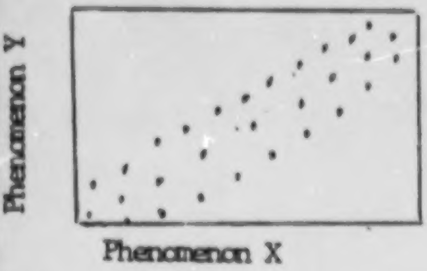


FIGURE B

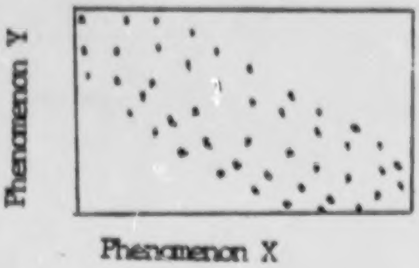
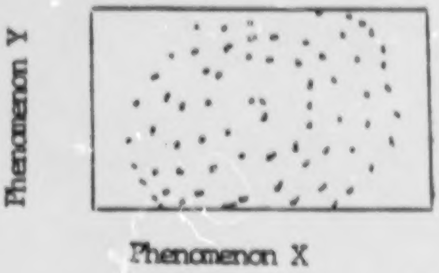
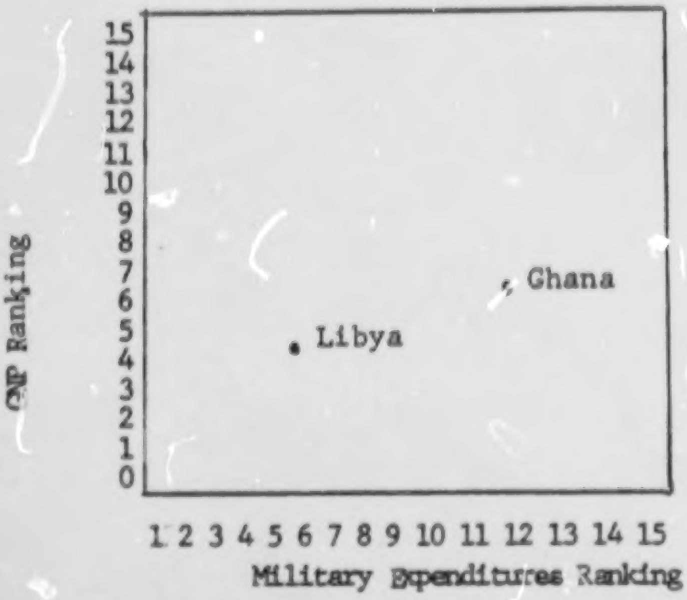
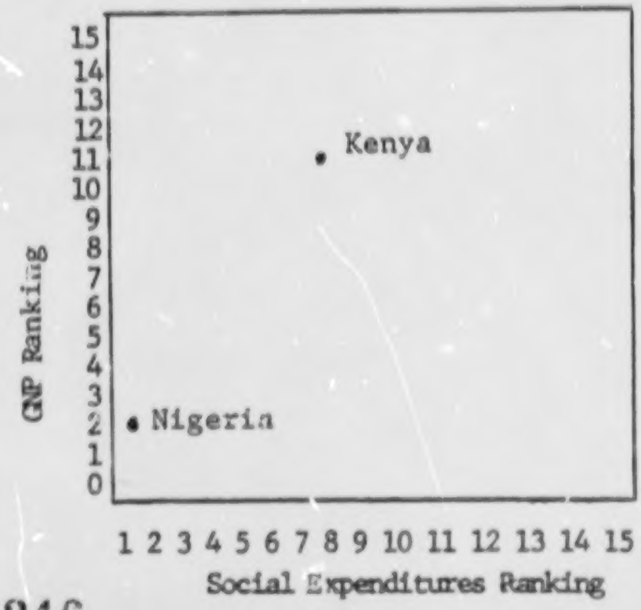


FIGURE C



Example: Countries of Africa





3. After the groups have completed the construction of scatter diagrams using data from the African countries, have them follow the same procedure for constructing scatter diagrams on the Far East countries.

4. After students complete their scatter diagrams ask the following questions:

   --With the African countries, does there appear to be any correlation between GNP and military spending? Yes. If so, is it positive or negative? Positive.

   --With the Far East countries, does there appear to be any correlation between GNP and military spending? Yes. If so, is it positive or negative? Positive.

   --What does a strong positive correlation mean? If one varaible increases, the other will also increase.

   --In this particular situation, what does a positive correlation mean in terms of the specific variables? If GNP increases, both military and social spending will also increase.

   --Were there any significant differences from this pattern among the countries of Africa? Yes, Ghana spent less on the military than its GNP would indicate. South Africa and Angola spent less on health and education.

   --Were there any significant differences among the countries of the Far East? Yes, the Philippines spent less on the military and Vietnam spent more than GNP would indicate.

NOTE: A useful exercise here would be to ask students, individually or in groups, to research the reasons why some countries in Africa and the Far East differ significantly from the positive correlation between GNP and public expenditures.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. The major quantitative concept emphasized in this module is CORRELATION. In the data presented in Student Materials #1, students may notice that there is a correlation for the 15 countries between GNP and military-social expenditures, but this relationship should not be explored until further in the module. The opening activity is designed only to stimulate student thinking about which countries allot the most to military and social expenditures and why. Later in the module, students construct scatter diagrams based on data of individual nations within two selected world regions and, at that time, they should see how two variables such as GNP and military spending or GNP and social spending correspond with each other.

2. RANK ORDER is a valuable technique because it places information in a logical order which can help us to describe and to compare the extremes of the measure used, e.g., the nation in a region with the highest GNP and the nation with the lowest. Students should be aware that rank order gives the relative positions of the items ranked but does not imply anything about the amount or distance between items on the rank order list. For example, the three nations with the highest GNP in the world would be relatively ranked 1, 2, and 3. However, the amount of difference in GNP between 1 and 2 will not be the same amount as the difference between 2 and 3, or between 3 and 4.

3. INDICATORS such as total expenditures and expenditures per capita are valuable social science tools that can help to describe and to compare larger, more complex social realities such as a nation's military and social expenditures. We should be aware, however, that the selection of an indicator will in part define and limit the larger social reality to be investigated.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lesson of the module.

1. Obtain a copy of World Military and Social Expenditures, 1978 from the Institute for World Order, 1140 Avenue of the Americas, New York, N.Y. 10036. (Cost - $2.50.) Students could explore such items as military and social spending trends in both developing nations from 1960-1976; major world arms suppliers, infant mortality rates, calorie supply per capita and % school-age population in school for 140 nations.

2. The Harvard Social Studies Project has produced a pamphlet entitled The Limits of War: National Policy and World Conscience which should help students to clarify their values on this particular topic. Included in the text is a case study entitled, "War for Tomorrow," which examines the problems of nuclear proliferation and the difficulties involved in winning a nuclear war. Available from American Education Publications, Education Center, Columbus, Ohio 43216.

3. Find some military-social cost equivalencies in your own community. How do military costs compare to the costs of projects that would improve the quality of life in your town? For example, to the cost of building and operating a municipal swimming pool? To providing day-care facilities? To cleaning up the town's river? To providing food stamps for the needy?

TOTAL GNP and EXPENDITURES for MILITARY, HEALTH, AND EDUCATION - 15 SELECTED CONUNTRIES, 1975.

Note: Ranking countries by number (1-15) is not used to denote world ranking but merely to assist you in making comparisons in relation to your own rankings.

GNP (million $ U.S.)

1. U.S. (1,516,300)
2. USSR (786,700)
3. Japan (492,541)
4. West Germany (424,745)
5. France (337,662)
6. China (286,000)
7. United Kingdom (228,510)
8. Italy (166,821)
9. Canada (152,121)
10. Brazil (107,800)
11. India (86,016)
12. Mexico (77,264)
13. Sweden (69,254)
14. Iran (54,555)
15. Saudi Arabia (33,920)

Military (million $ U.S.)

1. USSR (94,000)
2. U.S. (90,948)
3. China (18,000)
4. West Germany (15,299)
5. France (13,039)
6. United Kingdom (11,477)
7. Iran (7,742)
8. Italy (4,656)
9. Japan (4,640)
10. Saudi Arabia (4,260)
11. Canada (3,074)
12. India (3,008)
13. Sweden (2,344)
14. Brazil (1,872)
15. Mexico (581)

Health (million $ U.S.)

1. U.S. (46,590)
2. West Germany (26,334)
3. Japan (19,176)
4. France (17,887)
5. USSR (17,800)
6. United Kingdom (10,810)
7. Canada (9,433)
8. Italy (7,663)
9. Sweden (4,773)
10. China (3,000)
11. Brazil (960)
12. India (866)
13. Iran (845)
14. Mexico (462)
15. Saudi Arabia (437)

Education (million $ U.S.)

1. U.S. (86,600)
2. USSR (46,000)
3. Japan (27,733)
4. West Germany (19,110)
5. France (16,208)
6. United Kingdom (15,198)
7. Canada (11,561)
8. China (10,000)
9. Italy (7,479)
10. Sweden (5,125)
11. Brazil (3,773)
12. Saudi Arabia (3,675)
13. Mexico (2,620)
14. India (2,359)
15. Iran (1,894)

Source: World Military and Social Expenditures, 1978

EXPENDITURES PER CAPITA for MILITARY, HEALTH, and EDUCATION - 15 SELECTED COUNTRIES, 1975.

	Military Expenditures per capita		Health Expenditures per capita		Education Expenditures per capita
1.	Saudi Arabia $593 (3)	1.	Sweden $582 (1)	1.	Sweden $625 (2)
2.	U.S. $426 (5)	2.	West Germany $424 (3)	2.	Saudi Arabia $512 (3)
3.	USSR $370 (7)	3.	Canada $413 (4)	3.	Canada $506 (4)
4.	Sweden $286 (8)	4.	France $340 (6)	4.	U.S. $415 (7)
5.	France $249 (9)	5.	U.S. $218 (13)	5.	West Germany $308 (15)
6.	West Germany $247 (10)	6.	United Kingdom $193 (15)	6.	France $309 (16)
7.	Iran $221 (12)	7.	Japan $173 (16)	7.	United Kingdom $271 (18)
8.	United Kingdom $205 (14)	8.	Italy $137 (18)	8.	Japan $250 (21)
9.	Canada $135 (23)	9.	USSR $70 (27)	9.	USSR $181 (25)
10.	Italy $83 (30)	10.	Saudi Arabia $61 (31)	10.	Italy $134 (29)
11.	Japan $42 (49)	11.	Iran $24 (46)	11.	Iran $54 (46)
12.	China $19 (64)	12.	Brazil $9 (68)	12.	Mexico $44 (52)
13.	Brazil $17 (67)	13.	Mexico $8 (70)	13.	Brazil $35 (61)

Military Expenditures per capita	Health Expenditures per capita	Education Expenditures per capita
14. Mexico $10 (81)	14. Mexico $3 (97)	14. China $11 (97)
15. India $5 (101)	15. India $1 (118)	15. India $4 (121)

The figures in parentheses are the world ranking for 140 nations. For example, Saudi Arabia ranks third in the world for per capita military expenditures and the U.S. ranks fifth among 140 nations.

Source: World Military and Social Expenditures, 1978.

RANKING of COUNTRIES FROM TWO SELECTED REGIONS, AFRICA AND FAR EAST, by GNP, MILITARY, and SOCIAL INDICATORS, 1975.

A. Africa (ranking of each country in parenthesis)

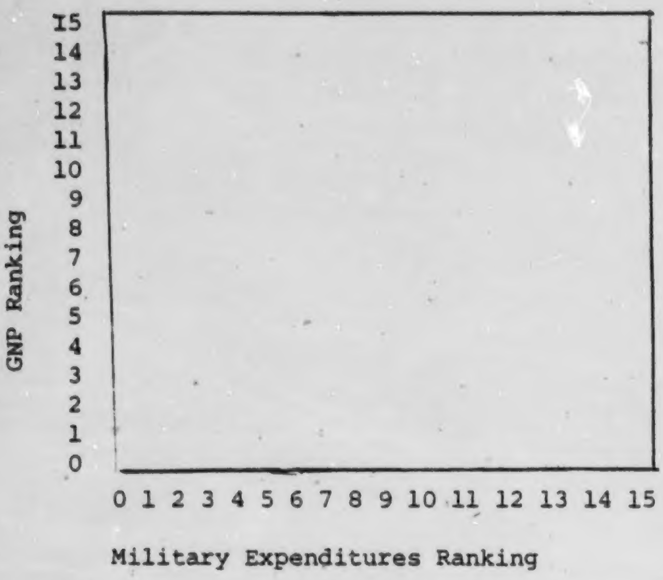
Country	GNP (million U.S. $)	Military (million U.S. $)	Health and Education (million U.S. $)
South Africa	33,698 (1)	1,441 (2)	696 (4)
Nigeria	25,383 (2)	1,875 (1)	1167 (1)
Algeria	13,839 (3)	262 (4)	933 (2)
Libya	12,245 (4)	203 (5)	795 (3)
Morocco	8,384 (5)	272 (3)	508 (5)
Ghana	5,222 (6)	61 (12)	271 (7)
Zaire	3,594 (7)	150 (6)	223 (9)
Angola	3,464 (8)	100 (8)	108 (13)
Ivory Coast	3,461 (9)	58 (13)	282 (6)
Rhodesia	3,400 (10)	101 (7)	178 (10)
Kenya	3,073 (11)	43 (14)	225 (8)
Ethiopia	2,635 (12)	89 (10)	103 (14)
Mozambique	2,679 (13)	98 (9)	56 (15)
Uganda	2,582 (14)	85 (11)	109 (12)
Cameroon	2,266 (15)	34 (15)	128 (11)

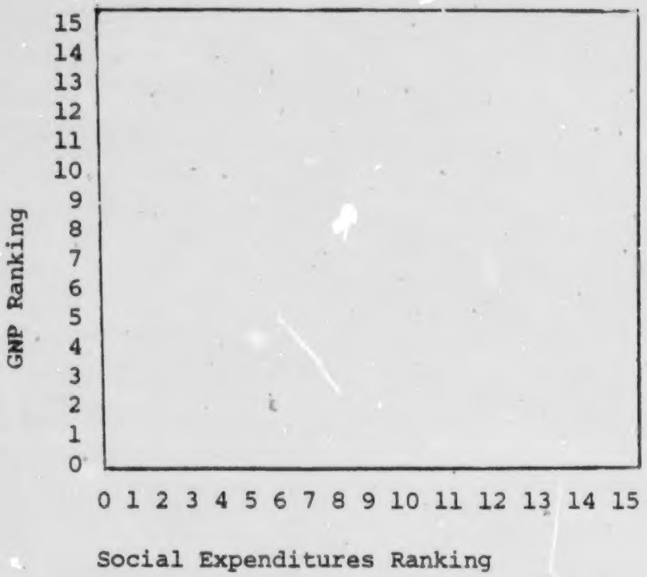
B. Far East (Ranking of each country in parenthesis)

Country	GNP (million U.S.$)	Military (million U.S. $)	Health and Education (million U.S.$)
Japan	492,541 (1)	4,640 (2)	46,854 (1)
China	236,000 (2)	18,000 (1)	13,000 (2)
Indonesia	27,485 (3)	1,104 (3)	955 (3)
South Korea	19,069 (4)	961 (5)	506 (7)
Philipines	15,634 (5)	404 (10)	387 (8)
Taiwan	14,474 (6)	988 (4)	868 (4)
Thailand	14,173 (7)	434 (9)	589 (6)
Malaysia	9,038 (8)	457 (8)	657 (5)
North Korea	6,790 (9)	700 (6)	194 (10)
Vietnam	7,100 (10)	500 (7)	192 (11)
Singapore	5,584 (11)	300 (11)	244 (9)
Burma	3,238 (12)	141 (12)	94 (12)
Mongolia	1,000 (13)	90 (13)	42 (13)
Cambodia	600 (14)	60 (14)	24 (14)
Laos	300 (15)	26 (15)	11 (15)

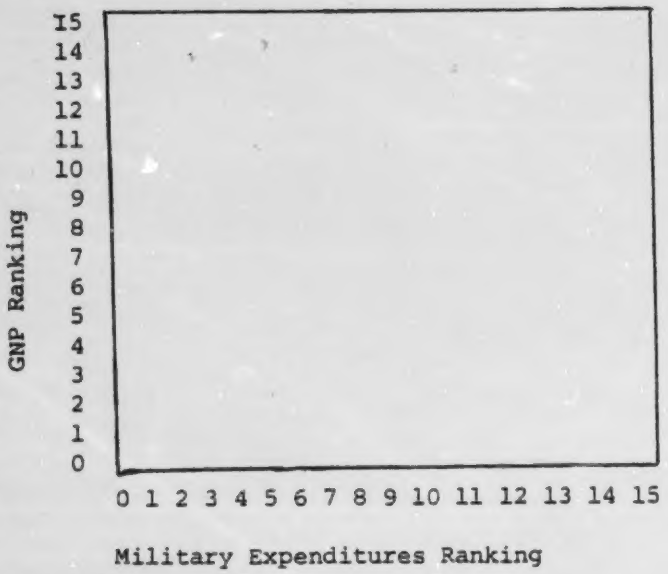
Source: World Military and Social Expenditures, 1978.

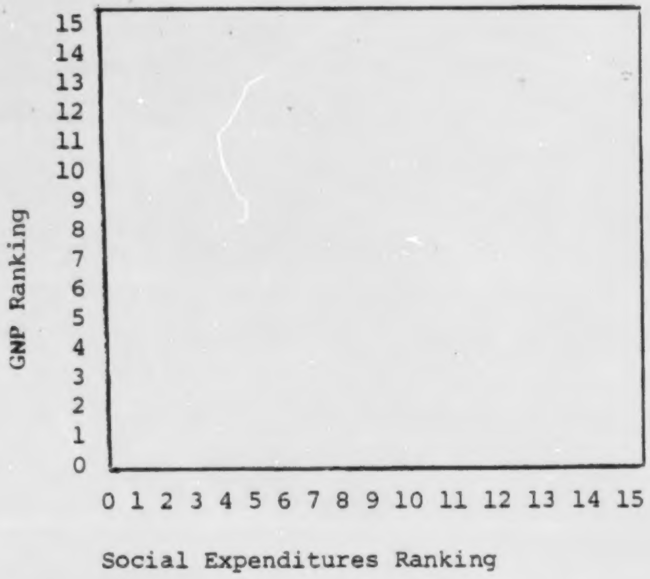
AFRICA





FAR EAST





Cluster III

AMERICAN IMMIGRANTS

A module for teaching secondary
students about American
immigrants with the aid of
quantitative concepts.

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Supplementary Teacher Materials

1. Immigration Causes (Information Sheet)

Student Materials:

1. Your Ancestors
2. Immigrants' Arrival: 1820-1976
3. Areas of Immigrants' Origin: 1820-1976
4. Immigrants' Origin: 1820-1976

OVERVIEW OF THE MODULE

Introduction

Where did our ancestors come from--Africa, Asia, Europe, the Middle East, other parts of the Americas? Why did our ancestors come to America and when did they come? This module explores these and other questions, including what factors influenced changing immigration patterns and who is defined as an immigrant. The module also introduces students to reading and interpreting bar graphs and circle graphs and to comparing information.

Our ancestors are of personal interest to many of us. Additionally, immigration patterns help describe how American society developed over time and our current societal mixture of peoples and cultures. This module leads to an examination of causes of migration, a comparison of how these causes may have affected the number of immigrants arriving from different countries at different points in time, and how students' personal history may compare to major immigration patterns of the past.

Description of Materials

Courses and Topics:

United States History: Immigration patterns.

Current Social Issues: Immigration patterns.

Grade Level:

7-9: Basic Activity.

10-12: With suggested activities for advanced students, the starred (**) items.

Time Required: Three class periods.

Concepts and Skills:

Social Studies Concepts: Immigration patterns.

Quantitative Concepts: Graphs (bar and circle) and percent.

Thinking Skills: Comparing, interpreting, and inferring.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Define the term immigrant.
2. Compare countries of origin of American immigrants, using historical information in graph form and students' personal histories.
3. Compare time periods of arrival in America by different immigrant groups, using historical information in graph form.

Source of Data:

The 1977 edition of the Statistical Abstract of the United States was the source of information presented in this module. The Abstract is published annually by the Bureau of the Census, Department of Commerce.

LESSON 1: IMMIGRANTS' ARRIVAL

Introducing the Lesson

NOTE: Introduce the lesson with a ten minute classroom activity and homework assignment the day prior to conducting the main body of the module.

1. Lead a brief discussion of students' ancestral backgrounds to stimulate interest in the topic of immigation. Discussion questions could include:

   --What languages, other than English, are read or spoken in the students' homes or in the homes of their friends?

   --To which ethnic organizations or clubs do students' or their family members belong?

2. Distribute "Your Ancestors" (Student Materials #1) and have students' complete it as a homework assignment.

Developing the Lesson

3. Identify when students ancestors came to America, using their homework assignment as the basis for class discussion.

   --On the chalkboard write column headings by time periods, e.g., 1800-1850, 1850-1900, 1900-1950, 1950-1978.

   --By time periods, have students identify when their ancestors arrived in America. On the chalkboard keep a running class total for each time period. Most students will report two arrival times, one for the fathers' side of the family and one for the mothers'; there is no need to distinguish between the two when posting the tally on the chalkboard. When all students have reported, have each student make a record of the class totals for later reference, e.g., 1800-1850 -- 5 arrivals.

4. Encourage students to estimate the degree to which their class data is typical. Stimulate student participation with questions such as:

   --How typical do you think the class data is for your community as a whole?

   --How would the class data compare to data for the entire nation?

   --If students think that the class data is not typical of the nation, discuss why this might be so.

5. Suggest that the class check their estimate against national data. Distribute and have students review briefly "Immigrants Arrival" (Student Materials #2), or make a transparency to use with an overhead projector.

6. Elicit student responses to the information presented in the bar graphs by asking questions such as:

   NOTE: Prior to 1820 immigration information was not collected systematically and therefore is not included in Bureau of the Census reports.

   --When did the largest number of immigrants, for any recorded decade, arrive? Between 1901 and 1910.

   --When did the smallest number of immigrants, for any recorded decade, arrive? Between 1820 and 1830.

   --What are the major trends indicated by the graph? A general increase in the rate of immigration from 1820 to 1910 and a general decrease in the immigration rate from 1910 to the present.

   --What is the cause of the major deviation in the general pattern of increase between 1820 and 1910? The economic depression of the 1890's.

   --What are the causes of the major deviation in the general pattern of decreased immigration since 1910? The world-wide economic depression of the 1930's and the global disruption caused by World War II.

Concluding the Lesson

7. Divide the class into small groups and have them make bar graphs of the class data to compare to the bar graph in Student Materials #2.

NOTE: The magnitude will differ from millions in the student materials to 60-80 for the class size. However, the shape and relative size of the bars in the two graphs will allow students to make an approximate, visual comparison of the degree to which class data is typical of national data.

8. Compare the students' previous estimates to what they now see in the bar graphs.

--How typical is the class data of national data?

--Within which time periods are the greatest deviations between class and national data found?

--Speculate again as to why class data differs from national data, if a difference is noted.

LESSON 2: COUNTRIES OF ORIGIN

Introducing the Lesson

1. Suggest that before continuing it is important to define the term immigrant. Allow students to brainstorm definitions or descriptive terms, and record them on the chalkboard. Selecting, where possible, from student-generated ideas, emphasize that:

    --An immigrant is a person who voluntarily and legally comes to a country to live for an indefinite period of time.

    --Many immigrants plan to become permanent residents and citizens of the new country; some immigrants plan to return someday to their native country.

    --Native Americans, according to one widely accepted theory, migrated from Asia to become some of the first immigrants to the area of North America.

    --Europeans (especially from France, Spain, Britain, and Holland) establishing colonies in the "New World" were early immigrants to the area of North America.

    --The many peoples from around the world who, legally and voluntarily, came after the Revolutionary War-founding of the nation are immigrants to the nation--the United States of America.

    --Black Americans, in many cases, form a special group in that their ancestors were forcibly brought to North America as slaves and did not fit the general definition of "immigrant." However, many other Black Americans' ancestors were immigrants to the United States from Africa, the Caribbean, and Central and South America.

Developing the Lesson

2. Identify from where students' ancestors came, using students' homework assignment as the basis for class discussion.

    --On the chalkboard write category headings for geographic areas, e.g., Africa, Asia, Europe, the Middle East, and Latin America.

    --By geographic areas, have students identify from where their ancestors came. On the chalkboard keep a class record by area. Many students will report two or more countries of origin for each side (mother and father) of their family. When all students have reported, have each student make a record of the class totals for later reference, e.g., Asia--12 immigrant ancestors.

3. Encourage students to estimate the degree to which their class data is typical. Elicit student responses with questions including:

   --How typical do you think the class data is for your community as a whole?

   --How would the class data compare to data for the entire nation?

   --If the students think that the class data is not typical of the nation as a whole, identify why the differences might exist.

4. Suggest that the class check their estimate against national data. Distribute and have students review briefly "Areas of Immigrants'Origin" (Student Materials #3), or make a transparency to use with an overhead projector.

5. Elicit student responses to the information presented in the bar graph by asking questions:

   --Which area has dominated as the area of origin of recorded American immigrants? Europe.

   --What data is not presented in the graph? The graph does not reflect Black Americans' ancestors forcibly brought to North America, or Native Americans and European colonists who migrated to North America before records were kept by the U.S. government. The graph does not indicate any changing patterns, e.g., within Europe there was a shift over time from northwest to southeast as the area of origin of European immigrants to America.

6. Emphasize that Student Materials #3 does not include illegal aliens, only legal immigrants. As a point of interest, note that:

   --The U.S. Immigration and Naturalization Service, in November 1977, estimated that there were approximately six million (6,000,000) illegal aliens in the United States. Other sources estimate the number of illegal aliens to be as high as ten million.

   --From 1970 to 1976 some three and one-half million (3,504,000) illegal aliens were apprehended in the United States by immigration officers.

**For advanced students and classes you may wish to discuss the controversial public policy questions raised by the issue of illegal aliens, including the degree to which they pay taxes and social security contributions, receive welfare benefits, cause higher unemployment rates among legal residents and citizens, damage the U.S. economy by sending part of their earnings abroad, pose a need for either new immigration laws or stricter enforcement of existing law, and raise foreign policy questions, e.g., with Mexico.

Concluding the Lesson

7. Divide the class into small groups and have them make bar graphs of the class data to compare to the bar graph in Student Materials #3.

NOTE: The magnitude will differ from millions in the student materials to 60-80 for the class. However, the shape and relative size of the bars in the two graphs will allow students to make an approximate, visual comparison of the degree to which class data is typical of national data.

8. Compare the students' previous estimates to what they now see in the bar graphs.

--How typical is the class data of national data?

--For which geographic areas of the world are the greatest deviations between class and national data found?

--Speculate again as to why class data differs from national data, if a difference is noted.

** 9. Student Materials #2, as noted previously, indicates the total flow of immigrants and does not reflect changing patterns over time. You may wish to have students construct a bar graph for the last quarter century and compare the 1951-1976 pattern with the class pattern. The number of immigrants, by region, for the last quarter century are:

Africa	--	98,800
Americas	--	3,469,800
Asia	--	1,403,300
Europe	--	3,256,000
Other	--	48,000
TOTAL		8,275,900

LESSON 3: IMMIGRATION PATTERNS

Introducing the Lesson

1. Ask students to answer the following questions, using Student Materials #2 and #3:

   --How many immigrants arrived from Europe between 1820 and 1860?

   --Between 1951 and 1976, what proportion (%) of immigrants arrived from Asia?

   --How many more immigrants arrived from Africa between 1951-1976 than arrived between 1931-1950?

2. Naturally, the students will be unable to answer the questions based on the two bar graphs, because one presents only ten year time periods and the other presents only totals by region for the entire 1820-1876 time period. The obvious conclusion which students should reach is that they need data which is:

   --Presented in greater detail.

   --Designed to indicate both time periods and geographic areas of origin.

   --Designed to indicate proportion (percent) as well as magnitude (total numbers).

Developing the Lesson

3. Distribute "Immigrants' Origins"(Student Materials #4). Indicate to students that in the social studies bar graphs are frequently used to indicate magnitude or total numbers, and circle graphs are a common method of presenting proportions or percentages.

Note for students that each circle graph also presents the yearly number of immigrants. Using the yearly figures, students can easily calculate the total number of immigrants for any specific time period to find the magnitude of immigration.

4. Clarify for students that:

--In reading the circle graph the proportion within each section of the circle graph provides a percentage (%) figure. For example, between 1820 and 1860, immigrants from Europe accounted for 95% of the total immigration flow to the United States.

--The underlined number to the lower right of each circle graph indicates the average number of immigrants arriving annually in the U.S. For example, between 1861 and 1900, average yearly arrivals were approximately 351,000 immigrants.

--The circle graphs cover, in different, more detailed form, the same general information on immigration previously presented in Student Materials #2 and #3.

5. Elicit student responses to the information presented in the circle graphs. Questions and points to be covered include:

NOTE: "Immigration Causes" Supplementary Teacher Materials #1 presents background information on major causes of immigration for each time period covered by the circle graphs. As you discuss the graphs you may wish to provide this background information to students.

--What has been the general trend of immigration to the United States from Europe? A steady decrease since the early 1800s, falling from 95% (1820-1860) to 36% (1951-1976).

--What has been the general trend for Asia? A very slight increase from 1860 through 1950, and a large proportional increase after 1950.

--What has been the general trend for Northern America? A steady increase from the early 1800s (2%) through 1950 (18%), and a decrease since 1950 (to 11%).

--What has been the general trend for Africa? A very slight immigration flow until the early 1900s, and only a slight increase (from ½% to 1%) since 1931.

--What has been the general trend for Latin America? A very slight immigration flow until the turn of the century, and a large proportional increase thereafter--from 5% (1901-1930) to 36% (1951-1976).

--Within Europe, what have been the differing trends? Immigration from Northern and Western Europe declined steadily from the mid-1800s through the early 1900s, increased sharply during the period preceding and immediately following World War II, and then dropped sharply during the last quarter century. Immigration from Southern and Eastern Europe increased sharply around the turn of the century and early 1900s , and has been decreasing since 1930.

6. In small groups, allow the students to work with the data to answer the following questions:

--Between 1861 and 1900 some 22% of immigrants come from Southern and Eastern Europe. Between 1901 and 1970 the proportion from that region increased to 58%. How many more people, on a yearly basis, came to the U.S. from Southern and Eastern Europe between 1901-1930 than came between 1861-1900? 22% of 351,529 is found by multiplying 351,529 x .22 = 77,336 immigrants annually from Southern and Eastern Europe between 1861 and 1900. 621,280 x .58 = 360,342 annually between 1901-1930. In answer to our question 360,342 - 77,336 = 283,006 more immigrants arrived annually between 1901-1930 than arrived annually between 1861-1900 from Southern and Eastern Europe.

--How many more immigrants, on a yearly basis, came to the U.S. from Latin America between 1951-1976 than between 1931-1950? 36% of 326,885 (326,885 x .36) is 117,679 immigrants. 15% of 78,173 (78,173 x .15) is 11,726 immigrants. 117,679 - 11,726 = 105,953 more immigrants arrived annually from Latin America between 1951-1976 than arrived between 1931-1950.

Concluding the Lesson

7. Still in small groups, have the class make a circle graph of the class data and compare it to the circle graphs in Student Materials #4. For example, in a class of 35 students there will be approximately 70 areas of origin reported. If 12 of the 70 report Asia as an area of origin then 12 ÷ 70 = .1714 or 17.14%--in the hypothetical class, 17% of the students ancestors were from Asia.

8. Compare the class data with Student Materials #4.
   --With which of the five circle graphs does the class graph most closely correspond?

   --What does this indicate about general causes for the immigration of students' ancestors?

9. To conclude, allow the class to brainstorm possible reasons why people might choose to migrate from one nation to another. These reasons could include:

   --To escape religious persecution or to seek religious freedom.

   --To escape poverty and famine or to seek economic opportunity, which might include better jobs, the opportunity to own a house or car, or a better education.

   --To escape political repression or to seek political freedom.

   --To seek a different lifestyle, which might include less formality or the ability to change social class or status.

   --To be with friends or relatives who migrate to the United States at an earlier period in time.

   To personalize this step, you could ask students if they know why their own ancestors migrated to North America or the United States.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. BAR GRAPHS, in the social studies, are a useful way of presenting magnitudes or total numbers and how those totals may change between time periods.
2. CIRCLE GRAPHS, in the social studies, are a useful way of presenting proportions or percentages of the total. A series of circle graphs may visually illustrate changing proportions over time.
3. The number of immigrants arriving in the U.S. each year has changed over time. The general trend was toward an increasing rate of immigration into the early 1900's and a general decrease in the rate thereafter. The depression of the 1890's, the "Great Depression" of the 1930's, and the World War II period account for some of the major fluctuations in the numbers of immigrants arriving in the U.S.
4. The areas of origin of immigrants to the U.S. has also changed over time. The general trend has been toward a declining proportion of European immigrants and a increasing proportion of immigrants from other areas, especially Asia and Latin America.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Have each student use a world map to locate the countries of origin of his or her ancestors. Estimate the distance between the countries of origin and the United States. Which student's ancestors traveled the farthest to reach the U.S.? When did they come to the U.S. and how did they probably travel? In many respects traveling half way around the world by jet today is not as "far" as was crossing only the Atlantic a hundred years ago.

2. Invite a recent immigrant and an immigration lawyer to visit the class and talk to students about immigration law and personal aspects of the immigration process. Have the class generate specific questions that they want answered and give these to the speakers at least a few days before they visit the class.

**3. For advanced students or classes, have students use the most recent Statistical Abstract of the United States to compare the number of legal immigrants admitted to the U.S. each year from 1970 to the present and the number of illegal aliens apprehended for the same time period. Such comparison leads to discussion of implications for employment patterns, social welfare costs, educational costs, and the impact on aliens attempting to enter to the U.S. legally.

AMERICAN IMMIGRANTS

SUPPLEMENTARY TEACHER
MATERIALS #1
(Information Sheet)

IMMIGRATION CAUSES

Some of the general causes of immigration to the United States include:

--1820-1860. In the 1820's and 1830's the largest groups of immigrants came from the British Isles, seeking better economic conditions. In the 1840's and the 1850's the largest groups were Germans fleeing political and religious strife and poor economic conditions at home, and Irish fleeing the "potato famine" and seeking economic opportunity. Growing opposition to the newcommers, especially growing anti-Catholicism, led to the formation of the Order of the Star Spangled Banner or the "Know Nothing" Political Party in 1849. The party opposed foreigners and pledged to support for political office only American-born Protestants.

--1861-1900. Immigration declined from Western and Northern Europe as economic and political conditions there improved. By the 1870's however, previous restrictions on leaving their countries were lifted, and people from Eastern and Southern Europe came to the U.S. in rapidly growing numbers to escape political and religious persecution and stifling economic poverty. In America, the depression of 1873 led to anti-Chinese sentiment on the West Coast and the Chinese Exclusion Act of 1882. In 1885 Congress repealed the Contract Labor Law which had allowed indentured labor from Europe. The depression of 1893 slowed immigration of those seeking better economic conditions.

--1901-1930. In 1907, due to rising anti-Japanese sentiment in California, Japan agreed to halt the flow of Japanese immigrants to the U.S. A 1917 act, passed over President Wilson's veto, set a literary requirement for immigrants. Legislation in the 1920's set quotas on immigrants by country of origin. The World War I years also had a negative effect on immigration. All of this notwithstanding, 1900-1920 saw the largest number of immigrants in U.S. history enter the country. Immigrants from Northern and Western Europe declined in number while the number coming from Southern and Eastern Europe rose rapidly. The flow of Canadian immigrants to Northern factory towns also grew significantly.

--1931-1950. During the Depression and World War II most quotas under the laws of the 1920's were not filled by immigrants. Following the war the ban on Orientals was lifted and thousands of "displaced persons" began to arrive from Europe.

--1951-1976. Immigration from Northern and Western Europe declined with the post-war economic recovery under the Marshall Plan, while the flow of immigrants from Southern and Eastern Europe remained stable due to economic and political instability in that area. Immigrants from Asia, Latin America, and the Middle East continued to be drawn to the U.S. due to its greater political stability and attractive economic situation. This period also includes a rapid rise of the entry into the U.S. of illegal aliens--most of them unable to enter with legal visas. Under a 1965 U.S. law, preference on admission to the U.S. is given to:

- Spouses, children, or parents, either of immigrants who are now U.S. citizens or who have a "permanent resident visa."
- Refugees
- People with certain professions or occupations in short supply in the U.S.

YOUR ANCESTORS

Historically, immigration has contributed significantly to the growth and development of the United States. In 1890, for example, New York City had one-half as many Italians as Naples, as many Germans as Hamburg, twice as many Irish as Dublin, and two and one-half times as many Jews as Warsaw. Immigrants today enter the United States at a rate of about 400,000 each year. As our declining birth rate diminishes the natural growth of our population, immigration is increasingly important as a cause of population growth in the U.S.A.

Complete the following questionnaire by asking your parents about your family history.

1. Approximately when (what year or what general time period) did your MOTHER'S ancestors come to the United States?

   ____

2. Approximately when (what year or what general time period) did your FATHER'S ancestors come to the United States?

   ____

3. From which country (or countries) did your MOTHER'S ancestors come?

   ____

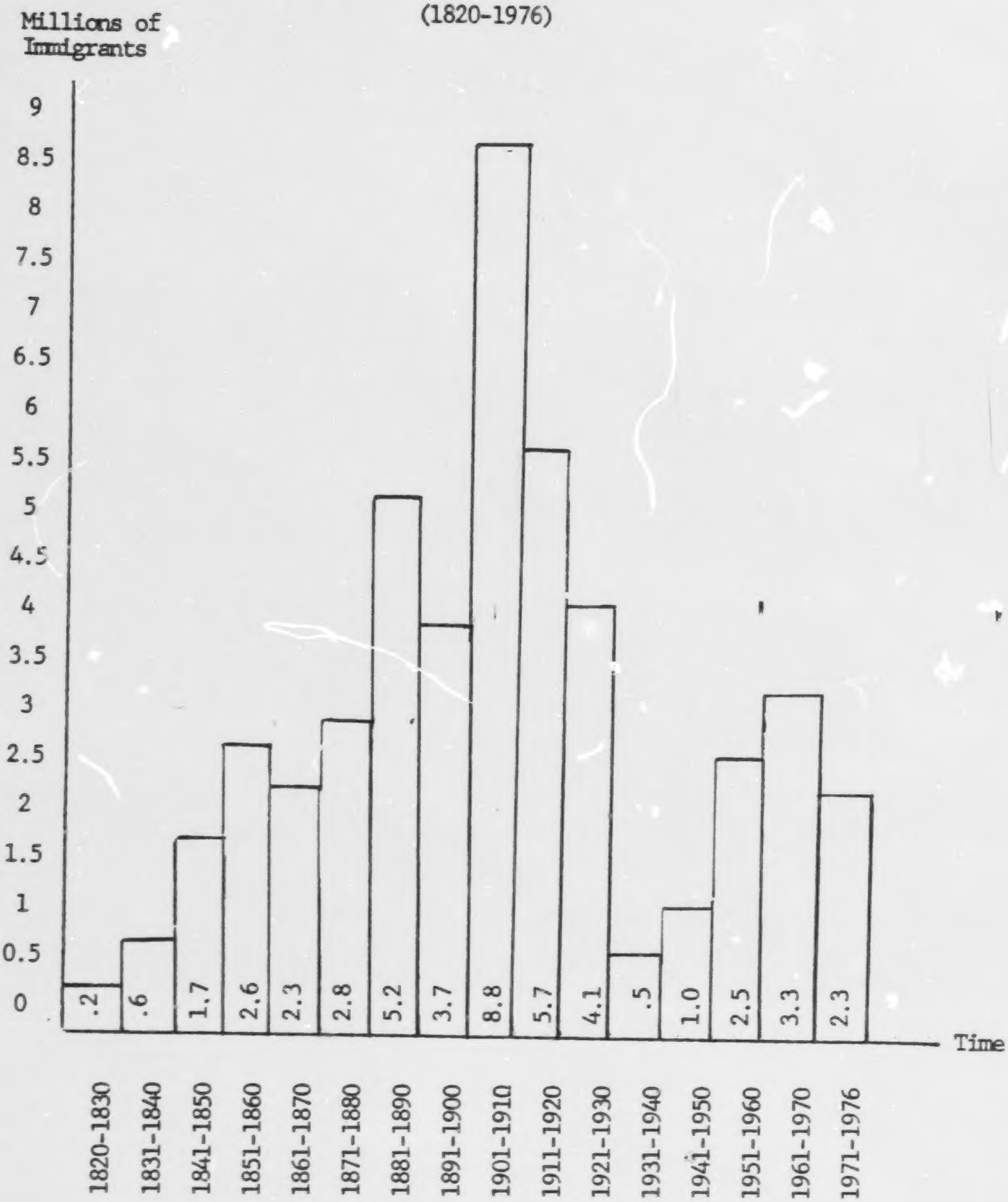
4. From which country (or countries) did your FATHER'S ancestors come?

   ____

Ancestor is someone from whom you are descended. Ancestors, by birth or adoption, include grandparents, great-grandparents, etc.

IMMIGRANTS' ARRIVAL

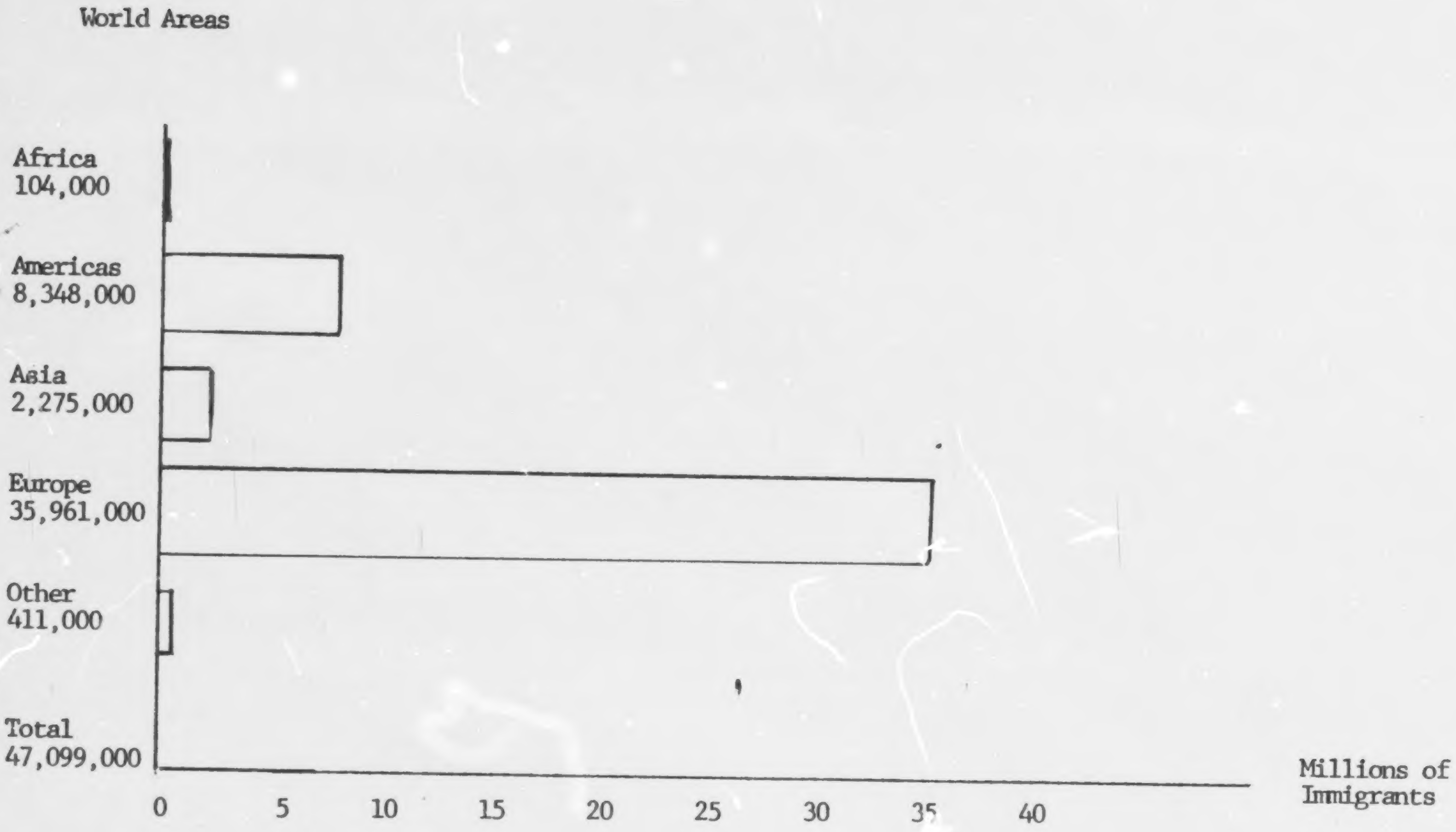
(1820-1976)



From materials in the Statistical Abstract of the United States: 1977, Department of Commerce, Bureau of Census, p. 81.

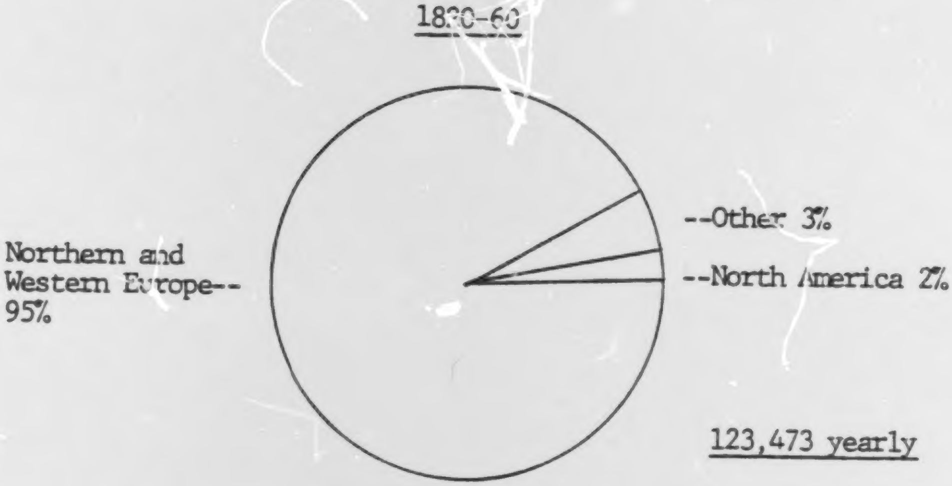
AREAS OF IMMIGRANTS' ORIGIN

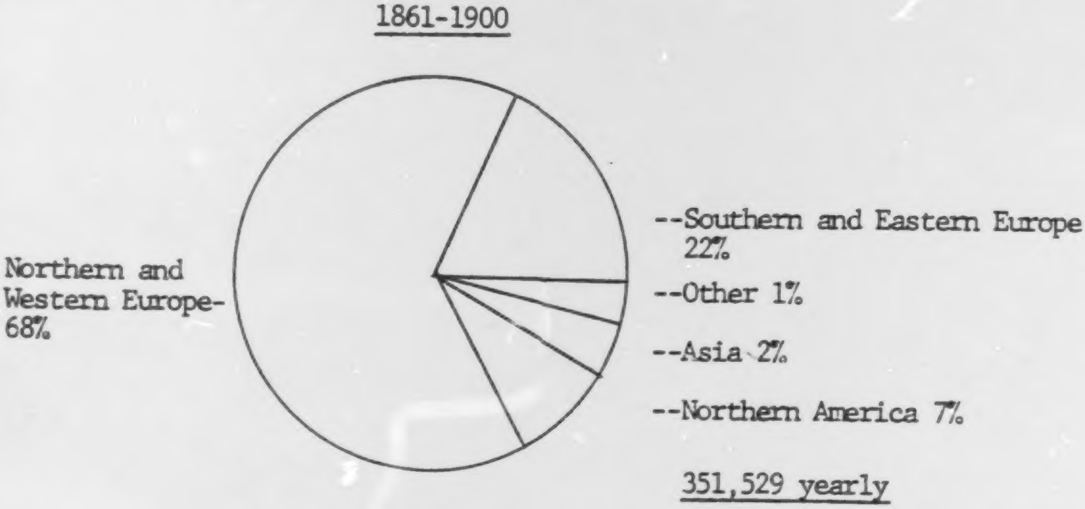
(1820-1976)



From materials in the Statistical Abstract of the United States: 1977, Department of Commerce, Bureau of the Census, p.83.

IMMIGRANTS' ORIGINS
(1820-1900)

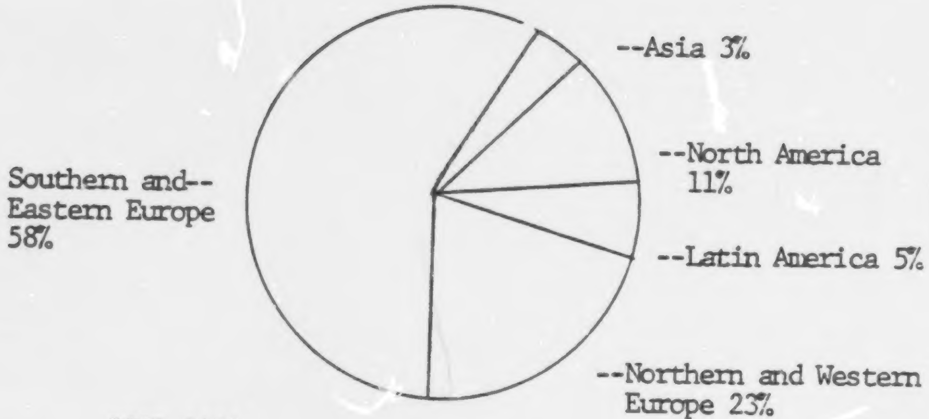




N. America-Canada
Latin America-Mexico, Central America, South America, Carribean.

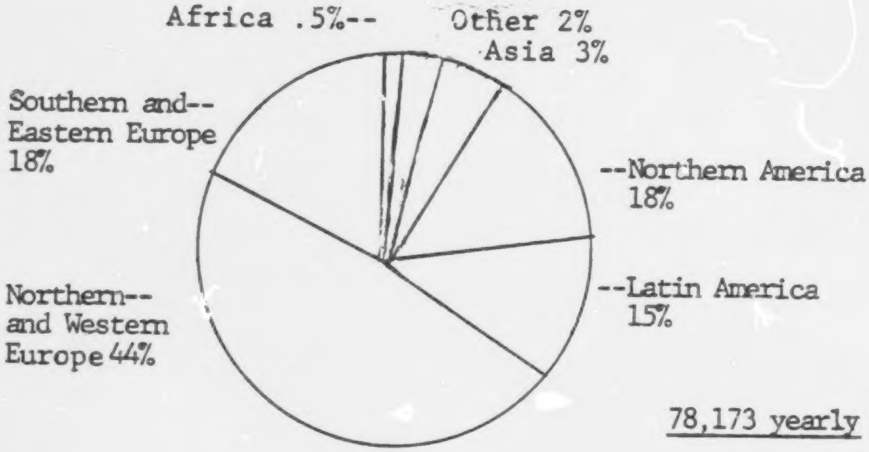
IMMIGRANTS' ORIGINS
(1901-1950)

1901-1930



621,280 yearly

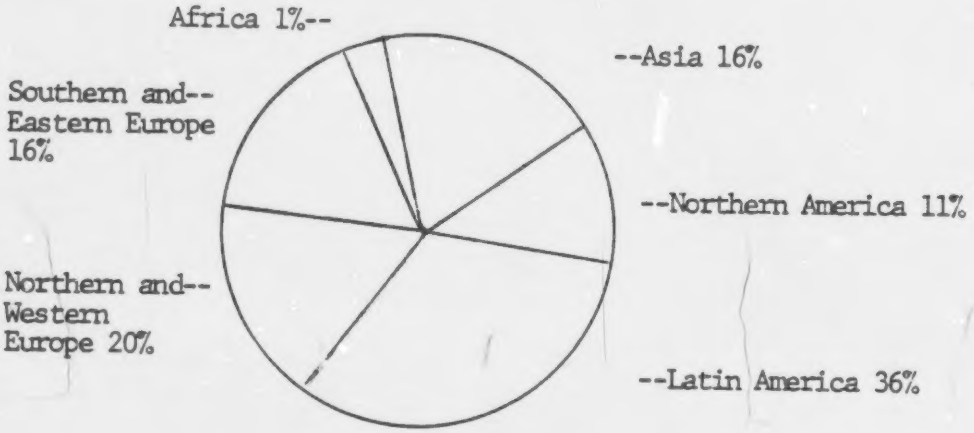
1931-1950



78,173 yearly

IMMIGRANTS' ORIGINS
(1951-1976)

(1951-1976)



326,885 yearly

From materials in the Statistical Abstract of the United States: 1977, Department of Commerce, Bureau of the Census.

RURAL--URBAN MIGRATION

A module for teaching secondary
students about migration within the
United States with the aid of
quantitative concepts.

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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3. Urban Americans
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RURAL--URBAN MIGRATION

OVERVIEW OF THE MODULE

Introduction

America is a nation of migrants. Our ancestors migrated to North America from other parts of the world. Most Americans will migrate at least once during their own lifetime--from rural to urban areas, from urban areas to the suburbs, from the north to the sun belt, from areas of low employment to areas of higher employment opportunities, and more. This module explores some of the historical patterns of American migration through the presentation of data in different graphs and tables.

Migration has been and continues to be an important phenomena in the United States. Most students have friends or relatives who have migrated and most students will themselves migrate. This module can lead to an examination of reasons for migration and patterns of that migration. It can also help students estimate the probability of their future migration and begin to explore personal choices about where and why one might choose to migrate.

Description of the Materials

Courses and Topics:

U.S. History: Migration and population.

Grade Level: 7-9.

Time Period: Two class periods.

Concepts and Skills:

Social Studies Concepts: Migration and population.

Quantitative Concepts: Tables, graphs (bar and line), and percentages.

Thinking Skills: Analyzing and interpreting.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Interpret migration data presented in bar and line graphs.
2. Identify and analyze causes for migration.
3. Interpret major trends in rural-urban migration in the United States.

Sources of Data:

The data on migration in the United States was taken from Bicentennial Statistics, 1976 published by the Bureau of the Census, and Historical Statistics of the United States, also published by the Bureau of the Census, Department of Commerce.

LESSON 1: RURAL--URBAN MIGRATION

Introducing the Lesson

1. Divide the class into small groups and distribute "What Would You Do?" (Student Materials #1).

   NOTE: There are four (4) separate fact sheets. Each group should receive only one fact sheet and a decision form.

2. Tell the groups that they are to imagine being in the situation of the person described by the fact sheet. Based on the information they have, the groups are to fill out their decision forms--deciding what they would do and why they would do it. Allow 10-15 minutes to complete the response forms in the student materials.

3. Allow a representative from each group to read the group's fact sheet to the entire class. Ask another member of each group to read the group's decision form to the class. Ask each group if there was one fact that was more important than anything else in reaching their decision. If so, what was the fact?

4. Encourage students to brainstorm a list of reasons the four persons had for migrating. Are there any reasons that are common--that are important for two or more of the four decision groups of people? Reasons could include:

   --Employment (groups 1, [illegible], and perhaps 4).

   --Health (physical health in group 3, perhaps mental health or well-being in group 4).

   --Recreation (groups 1, 3, and 4).

   --Interesting environment (groups 1, 3, 4, and perhaps the wife in group 2).

   --Family and friends (could be a factor in all 4 cases).

5. Summarize that there are many factors that influence a decision to migrate--or not to migrate. To one degree or another, many of these factors will influence each potential migrant. Certain factors, such as employment, have been important to migrants throughout recorded history.

6. Conclude by encouraging students to brainstorm a definition of migration. You might wish to define migration as moving from one locality or region to another. Moving between countries, states, and cities is migration. In a strict sense, even moving from one part of a city or county to another part of the same city or county can be considered migration.

Developing the Lesson

7. Inform students that American cities have been growing since the colonial period. When the first census was taken in 1790 only 5.1% of the population lived in cities. The largest city in 1790, Philadelphia, had a population of only 42,000. By the 1970 census almost 75% of the American population lived in cities, and Philadelphia had been replaced as the largest city by New York with a population of over 9 million inhabitants. The growth of the nations cities in the past 100 years has been spectacular.

8. Distribute copies of "Rural--Urban Americans" (Student Materials #2) and "Urban Americans" (Student Materials #3), or make transparencies to use with an overhead projector.

9. Encourage student review of the data by asking questions, including:

   --When did the total number of Americans living in urban areas surpass the number living in rural areas? According to the line graph, sometime around 1920. The bar graph supports this conclusion.

   --How have urban and rural population growth rates differed, as indicated by the line graph? The numbers of people living in rural areas grew steadily from 1790 through 1940 and then declined somewhat. The number of people living in urban areas remained low until the mid 1800's and then grew rapidly.

   --Which is the only time period in this century when the percentage of people living in urban areas failed to grow? Why? The 1930's, according to the bar graph. The 1940 census shows the same percentage urban as did the 1930 census. The Great Depression temporarily halted the urban migration of Americans.

BEST COPY AVAILABLE

--What would you predict as the results of the 1980 U S. census count of the urban population in America? The urban population will continue to grow.

--How does this data correspond to the decisions students made for the four cases in the opening activity?

10. Tell students that the 1970 census indicates that only 26.5% of Americans lived in rural areas. Place the following table on the chalkboard to indicate where Americans were living in 1970.

U.S. Rural--Urban Population: 1970

Location	Percent of Total Population
Cities of 1,000,000 or more	9.2%
Cities of 500,000 to 1 million	6.4%
Cities of 100,000 to ½ million	12.2%
Cities of 25,000 to 100,000	17.0%
Cities of 2,500 to 25,000	20.9%
Other Urban areas	7.8%
Rural areas	26.5%

11. Encourage review of the data by asking:

--In 1970, what proportion of Americans lived in cities of over one million inhabitants? 9.2%

--In 1970, what proportion of Americans lived in cities of 100,000 or more? 27.8%

--In 1970, 26.5% of the population lived in rural areas? What proportion of the population lived in cities? 73.5%

12. Distribute "The States" (Student Materials #4). For your own state, have students figure the percent urban. The size of the urban population divided by the size of the total state population will give the percent urban for the state, e.g., in Hawaii 639 ÷ 769 = .83 or 83% urban. What is the percent urban for your state?

13. You may wish to divide the class into nine small groups and have each group figure the percent urban for all states in one of the nine geographic regions, and then make a bar graph for that regions. Compare graphs between regions.

Concluding the Lesson

14. Summarize for students that since the turn of the century there has been a general migration trend of Americans moving from rural areas of the country to urban areas. Ask students to identify major migration movements in America in the post World War II period. Answers could include:

    --Migration from urban areas to the suburbs.

    --Migration to the sunbelt states.

    --A recent movement to migrate from metropolitan areas back to small towns or rural areas.

    --A recent movement in some cities to migrate back into renovated homes in urban areas. This movement is sometimes called the regentrification of the inner city.

15. Have students write a brief paragraph answering the question--If you were to migrate, to where would you migrate? For what reasons would you choose this location as your migration destination?

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. There are many reasons why a person would decide to migrate, or, not to migrate. Frequently, a combination of reasons will affect the migration decision.
2. Migration maybe defined as any movement from one geographic area or locality to another.
3. The population of the U.S., in total numbers, increased with each census between 1790 and 1940. After 1940, the total size of the rural population declined slightly while the size of the urban population continued to grow steadily.
4. The 1920 census indicated, for thr first time, that more Americans lived in cities than in rural areas.
5. The largest proportion of urban Americans in 1970 lived in towns and smaller cities--urban areas of less than 100,000 population.

ADDITIONAL ACTIVITIES

1. Have students figure the average urban rate (percentage) for each of the nine regions in Student Materials #4 and make a bar graph--percent urban by regions of the U.S. Which regions are the most urban? Which areas the least urban? Speculate as to the areas of greatest change today.

WHAT WOULD YOU DO?

Decision Group #1

- You have just received your college degree (B.S.) in engineering from a small engineering college in the midwest. You have always lived in the midwest and like it there. All of your friends and most of your relatives also live in the midwest.

- You have job offers as an engineer in Houston, Denver, Seattle, Ann Arbor, and Atlanta. The pay in all of the cities is good. The pay in Denver is the lowest, but you think that Denver would be a good place to live so you could learn to ski. You also liked Seattle but wonder if it rains too much there for you to like it--you did like the person in Seattle who would be your supervisor. You haven't been to Houston or Atlanta as representatives from companies in those cities interviewed you for a job when they visited your college. Of the 5 cities, Houston's job pays $750 a year more than any other but the job in Atlanta might be the most interesting and challenging. Ann Arbor is in the mid-west, an area of the country that you consider to be home.

- You also have a job offer at the large oil refinery in your home town. This job pays almost as much as the Houston job. You could live at your parents house and save money by not paying rent, though you aren't sure you want to live at home.

- You have some friends from college taking jobs in distant states, but most of your friends are staying in the midwest and taking jobs in places like Chicago, Detroit, Milwaukee, Cincinatti, Indianapolis, and Toledo.

- Your sister, who went to college in California and now lives in Denver, tells you to be adventurous and live someplace other than the midwest to "broaden your experiences."

- Your boyfriend thinks that he should let you make up your own mind, so he doesn't want to give you his opinion about what he would do in your place. However, you know that he would prefer that you stay in the midwest.

WHAT WOULD YOU DO?

Decision Group #2

- You live in New England on a small farm. The farm alone can't support your family so you also work in a small factory in town. The factory just closed and you have lost the job you depended upon for additional income.
- You think that you could find part-time work in the city nearby but that is a one-hour commute each way which takes a lot of time out of your day, especially in the winter when the snow is heavy.
- You have a two-year old child and you and your wife have decided that she (your wife) shouldn't get a job until the child starts school.
- You know that the farm by itself won't support your family. You can't afford to buy more farm land but you have thought of trying to rent enough land so that your farming would support your family. However, you know that farming is a risky business.
- Your old factory foreman has a job at a new factory in one of the southern states. He is a crew chief and has a job for you if you want to sell your farm and move. The factory is new, the pay is good, and he tells you that the cost of living is lower than it is in New England.
- Your family settled in New England in 1760 and you are not sure you want to move. You are somewhat afraid of trying something so new in a part of the country where customs, and even the way people talk, are different.
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WHAT WOULD YOU DO?

Decision Group #3

- You are going to retire early because your company has a good retirement plan. So, next June, on your 55th birthday, you will retire as manager of the sales division.
- You have spent the last ten years in the Washington, D.C. area, and you know that you want to move somewhere else. Your wife also is ready to move and plans to retire at the end of the school year from her job as vice-principal of a private school.
- One reason to retire early is that, due to thirty years of smoking, you have emphysema. Your doctors tell you that you must quit smoking and move to a warmer, less-humid climate. You like the idea of living in Sun City, Arizona--a retirement community where everyone is a retired person. The climate would be fine and you could play golf almost every month of the year.
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- Your daughter's family now lives in San Diego. However, her husband is in the Navy and will be transferred in two years. They will probably move to the east coast or to a navy station overseas. Once before her husband was stationed in Rota, Spain.
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- Your son lives in Denver. He suggests that you live in Denver in the summer and in the winter travel around the southern U.S. in a camper. You like Denver, but it has the worst auto pollution problem in the nation and your doctor tells you that you probably shouldn't consider living there because of your health. You also wonder if gasoline would be available to travel as your son suggests.

WHAT WOULD YOU DO?

Decision Group #4

- You just got a divorce after being married for two years. You don't have any children. You are twenty years old.

- You went to work for a large department store right after you graduated from high school and got married. You like being a salesperson and are good at your job. If you stay with the store you know you will do well and probably become a department-head within four or five years. If you leave, your supervisor will give you a very good recommendation.

- You know that, as a good salesperson with a good record, you could find good jobs in other cities. If fact, the store you now work for has stores in two other cities in the state.

- You think that you might like to make a major change in your life. The divorce has strengthened this desire. You don't want to change careers but you might want to change jobs and change where you live. Your friends all live in the same city but you aren't afraid of the idea of moving to another place and making new friends.

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- Your cousin and his wife live in a small town in Idaho and love it there. You wonder if a small town wouldn't be nice after living in a large city all your life. Some friends say it would be boring but your cousin likes it because of the hiking, skiing, and friendly people. You have enough money saved to visit either Florida or Idaho, but not both.

WHAT WOULD YOU DO?

Decision Form

Conditions Favoring Migration	Conditions Against Migration
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2.	2.
3.	3.
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Your decision: ______________________________

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Your reasons: ______________________________

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Additional information you would like to have: ____________

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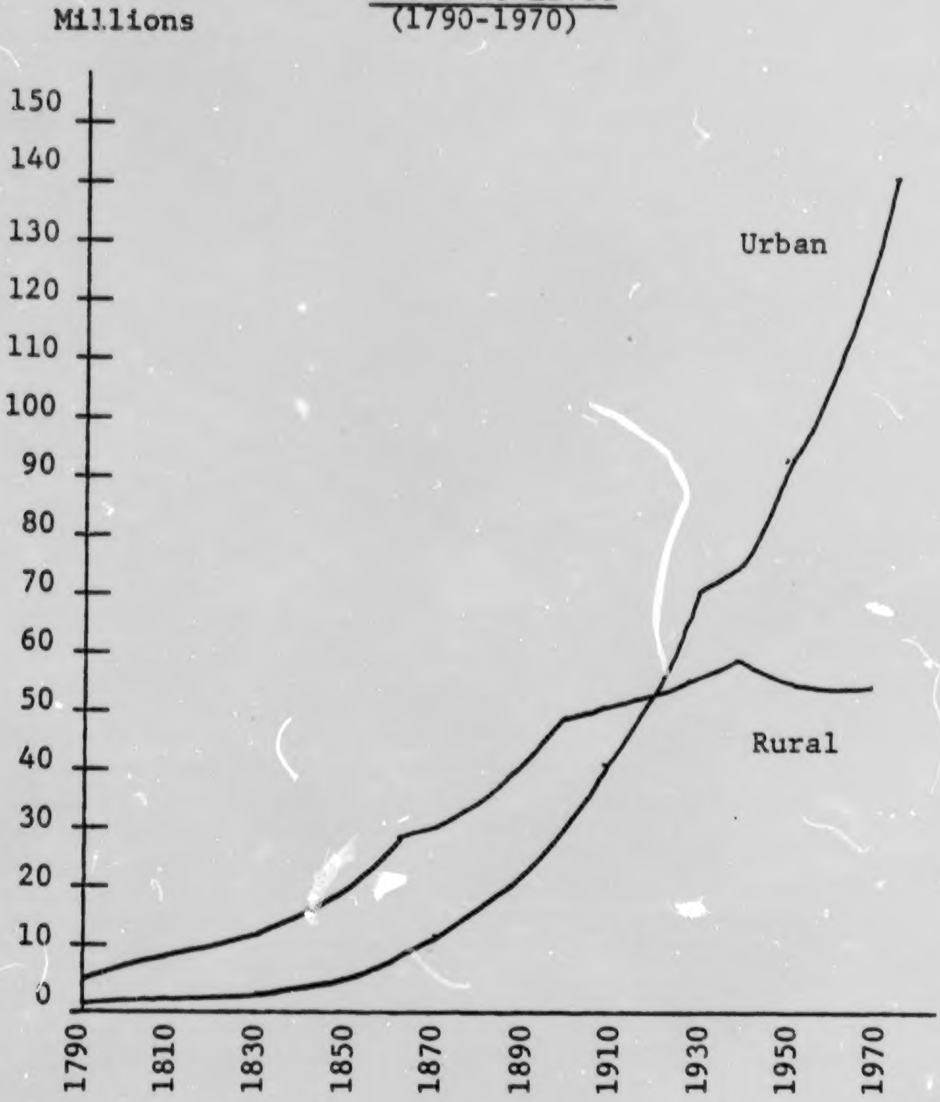
RURAL--URBAN AMERICANS

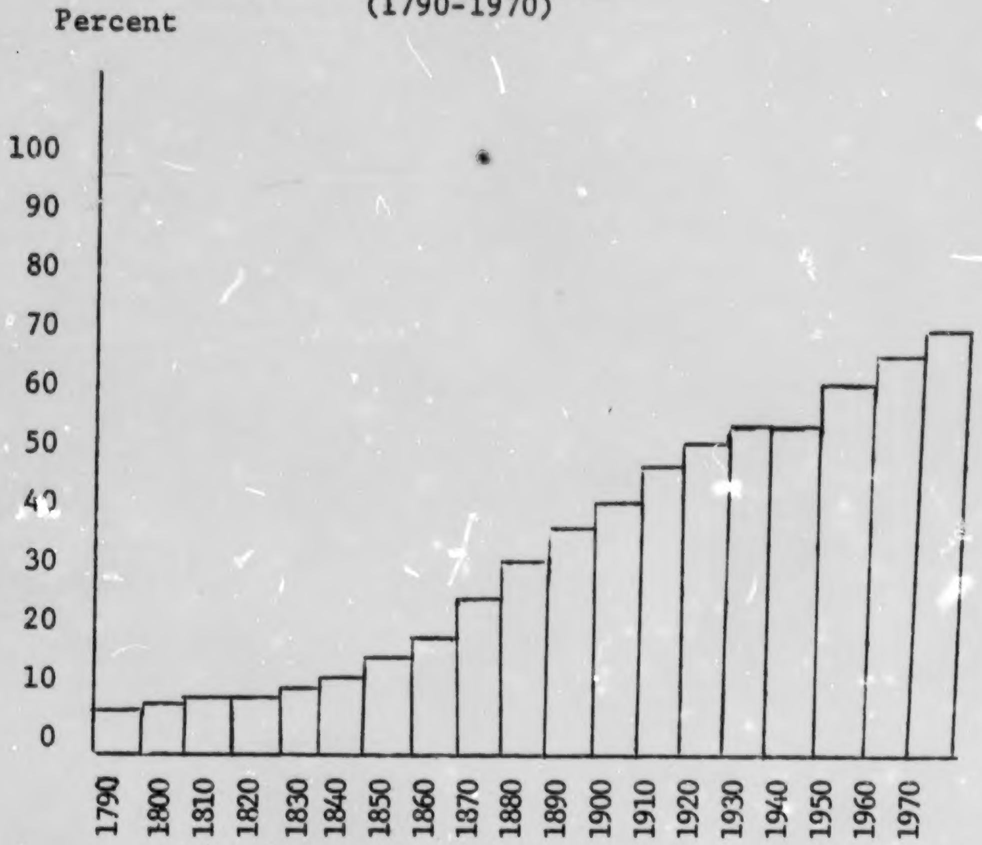
Where We Lived
(1790-1970)



Source: Bicentennial Statistics, Bureau of the Census, U.S. Department of Commerce, Figure #34, 1976.

URBAN AMERICANS

Growing Cities
(1790-1970)



Source: Calculated from data in Historical Statistics of the United States, Bureau of the Census, U.S. Department of Commerce.

Percentage of U.S. population living in urban areas, 1790--1970, according to census data.

THE STATES: 1970

Region and States	Total Population *	Urban Pop. *
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Vermont	444	143
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Rhode Island	947	825
Connecticut	3,032	2,345
2. Middle Atlantic		
New York	18,237	15,602
New Jersey	7,168	6,373
Pennsylvania	11,794	8,430
3. East North Central		
Ohio	10,652	8,026
Indiana	5,194	3,372
Illinois	11,114	9,230
Michigan	8,875	6,554
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Iowa	2,824	1,616
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Calculated from data derived from various documents of the Bureau of the Census, U.S. Department of Commerce.

WHAT WOULD YOU DO?

Decision Group #1

. You have just received your college degree (B.S.) in engineering from a small engineering college in the midwest. You have always lived in the midwest and like it there. All of your friends and most of your relatives also live in the midwest.

. You have job offers as an engineer in Houston, Denver, Seattle, Ann Arbor, and Atlanta. The pay in all of the cities is good. The pay in Denver is the lowest, but you think that Denver would be a good place to live so you could learn to ski. You also liked Seattle but wonder if it rains too much there for you to like it--you did like the person in Seattle who would be your supervisor. You haven't been to Houston or Atlanta as representatives from companies in those cities interviewed you for a job when they visited your college. Of the 5 cities, Houston's job pays $750 a year more than any other but the job in Atlanta might be the most interesting and challenging. Ann Arbor is in the mid-west, an area of the country that you consider to be home.

. You also have a job offer at the large oil refinery in your home town. This job pays almost as much as the Houston job. You could live at your parents house and save money by not paying rent, though you aren't sure you want to live at home.

. You have some friends from college taking jobs in distant states, but most of your friends are staying in the midwest and taking jobs in places like Chicago, Detroit, Milwaukee, Cincinatti, Indianapolis, and Toledo.

. Your sister, who went to college in California and now lives in Denver, tells you to be adventurous and live someplace other than the midwest to "broaden your experiences."

. Your boyfriend thinks that he should let you make up your own mind, so he doesn't want to give you his opinion about what he would do in your place. However, you know that he would prefer that you stay in the midwest.

WHAT WOULD YOU DO?

Decision Group #2

- You live in New England on a small farm. The farm alone can't support your family so you also work in a small factory in town. The factory just closed and you have lost the job you depended upon for additional income.
- You think that you could find part-time work in the city nearby but that is a one-hour commute each way which takes a lot of time out of your day, especially in the winter when the snow is heavy.
- You have a two-year old child and you and your wife have decided that she (your wife) shouldn't get a job until the child starts school.
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RURAL--URBAN AMERICANS

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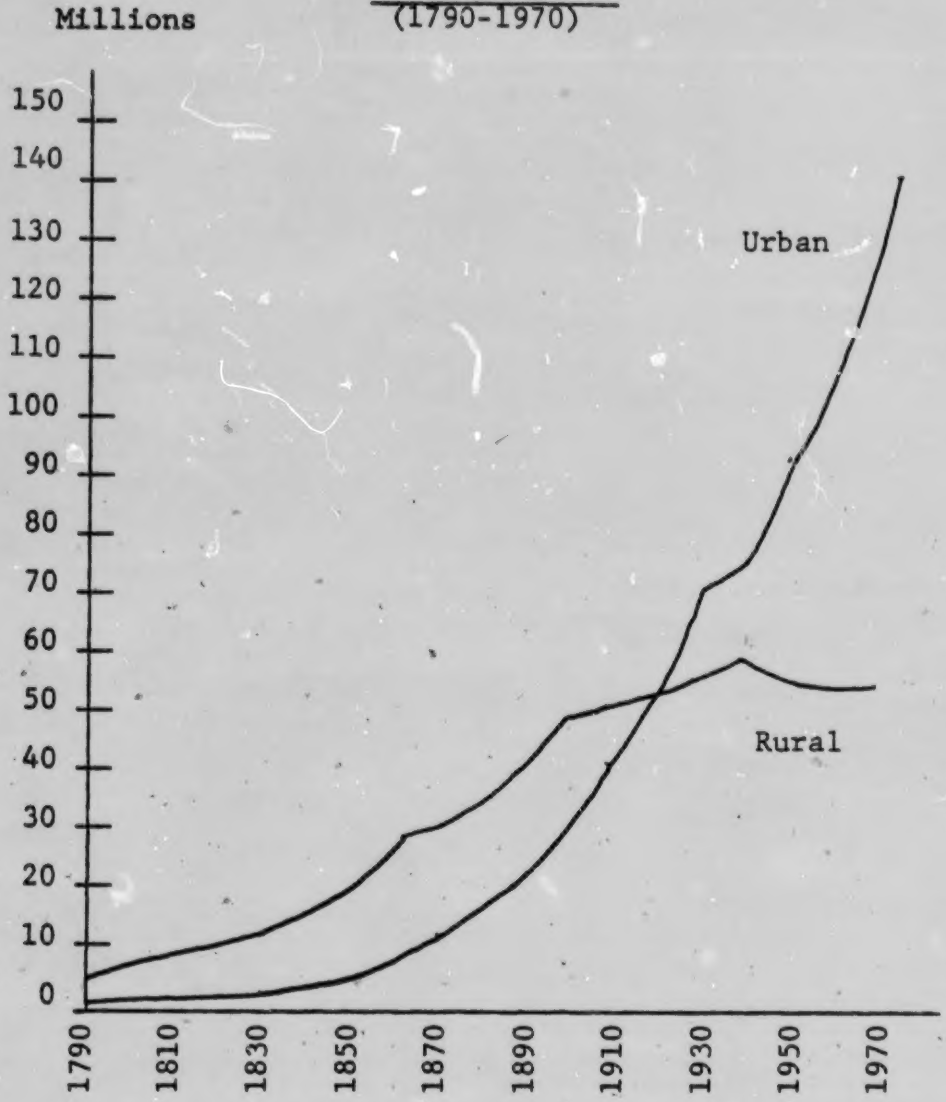

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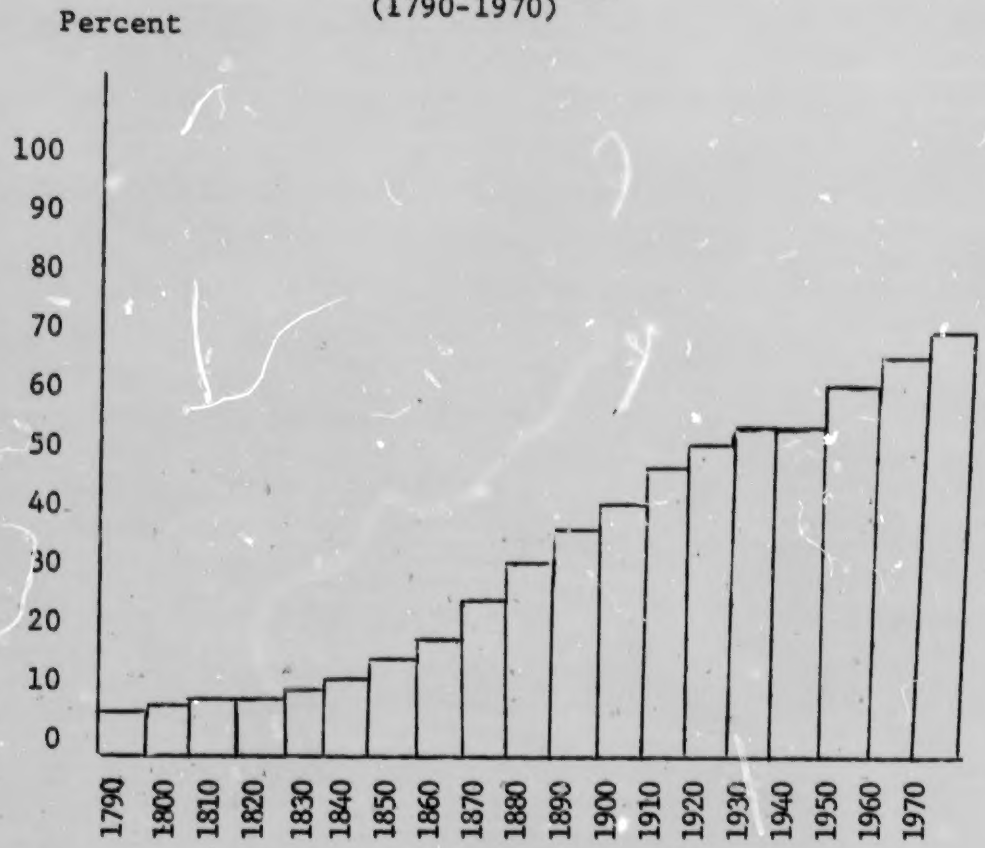
URBAN AMERICANS

Growing Cities (1790-1970)



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PROBLEMS: POPULATION DATA

A module for teaching middle school students
about the problems of gathering population data
with the aid of quantitative concepts.

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author (s) and do not necessarily reflect the views of the National Science Foundation.

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Boulder, Colorado 80302

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Student Materials

1. Survey Form - Who Am I?
2. Persons of Spanish Origin - Selected Characteristics - 1976.
3. The 1970 Census: What It Will Ask.
4. Sample Table Format.

OVERVIEW OF THE MODULE

Introduction

What are the steps necessary to conduct a census? Why are certain ethnic sub-groups of the population not included in census data? Why is it important to take an accurate census? This module explores these and related questions through the use of data tables and a data gathering activity.

Those involved in making important decisions, government officials, law makers, educators, and others, increasingly have a need for accurate information about the population. This module uses the complexities associated with identifying one's ethnic heritage as an example of the overall difficulties in taking an accurate census. In the process of understanding these difficulties, students should improve their skills in formulating questions, gathering data, analyzing data, and making decisions.

Description of the Materials

Courses and Topics:

Ethnic Studies:	Ethnicity and ethnic group.
American History:	Social protest, contemporary social and cultural trends, and ethnic groups.
American Government:	Identification of population sub-groups, use of public data, and ethnic groups.
Current Social Problems:	Social services and economic opportunity.

Grade Level: 7-9.

Time Required: One-two class periods.

Concepts and Skills:

Social Studies Concepts: Population sub-groups, Spanish heritage persons, discrimination, population distribution.

Quantitative Concepts: Tables.

Thinking Skills: Analyzing and interpreting.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Read and interpret data presented in tables.
2. Investigate difficulties in identifying precise ethnic sub-groups to be included in census data.
3. List the steps necessary to conduct a census.
4. Investigate difficulties associated with taking an accurate census.
5. Discuss the reasons why it is important to take an accurate census.

Sources of Data:

The 1977 edition of the Statistical Abstract of the United States was the source of data for the table on selected characteristics of Spanish origin persons. The Abstract is published annually by the Department of Commerce, Bureau of the Census. The 1970 and 1980 census forms are also available from the U.S. Department of Commerce, Bureau of the Census.

LESSON 1: NO CONSENSUS ON THE CENSUS

Introducing the Lesson

1. To collect the information needed for the opening activity in the module, distribute "Who Am I" (Student Materials #1). Ask students to check off the group which indicates their ethnic heritage. If they have a mixed heritage, two or more categories should be checked.

2. Next, have the students fill out the bottom half of the form by placing a check next to the reason (s) which best describe their choice of ethnic heritage.

3. Tabulate the responses and put them on the board.

   --How many students checked off more than one ethnic group?

   --How many students checked off the "Other" category?

   --Which criteria was used the most by students to describe the basis of their ethnic heritage?

   --Which criteria was used the least?

4. Discuss with students the problem of establishing the proper criteria for defining one's ethnic heritage.

   --What are some of the methods we might use to determine an individual's ethnic identity? Visual identification, self identification, use of the language, national origin, and surname identification are the most commonly used methods.

Developing the Lesson

5. After introducing students to the problems of identifying an individual's ethnic heritage, point out that those who gather population information, such as the U.S. Census Bureau, have encountered similar problems in identifying an individual's ethnic heritage. Hand out "Persons of Spanish Origin Selected Characteristics: 1976," (Student Materials #2) and have the students complete the worksheet accompanying the table.

6. Verify students' answers to the worksheet.

    --Title, Persons of Spanish Origin - Selected Characteristics: 1976.

    --Other titles, Persons of Hispanic Heritage, Persons of Spanish Surname, Persons of Spanish-American Origin.

    --Source, U.S. Statistical Abstract, 1977, published by the Bureau of the Census, Department of Commerce.

    --Year, 1976.

    --Unit of measure, thousands. For example, the total number of Spanish origin persons identified by the survey was 11,117,000.

    --Sub-groups of Spanish origin, Mexican, Puerto Rican, other.

    --Characteristics, Sex, Martial Status, Residence of Families.

    --"Other" sub-groups, Cubans, Columbians, and immigrants from various other Latin American countries.

    --Identification of sub-groups, no information is provided. For example, we do not know whether the table takes into consideration the number of illegal immigrants from Mexico, now estimated to be nearly 2 million people.

7. Inform students that finding the answers to the worksheet questions requires them to read the table in a systematic way that they should always follow. A good way to read a table is to consider:

    --The title of the table.
    --The source of the information presented.
    --The footnotes to the table.
    --The column and headings on the table.
    --The units of measure used in the table.
    --Any variability (major trends or discrepancies) in the data that may be readily noted.

8. The following questions may be used to discuss student response to the data:

--What may be problems with this data? We do not know whether those who were classified as Mexican or Puerto Rican were properly identified or not. Also, since we do not know which sub-groups of Spanish heritage are represented under the category of "other", we cannot determine whether any sub-groups were left uncounted.

--If your ethnic heritage fell under the category of "Other", how would you feel about being excluded from the table? Most students would probably feel that their ethnic group had been treated unfairly.

NOTE: An interesting parallel here would be to set up a hypothetical data table with only three categories: English, German, and other. Ask those student of European descent who are not English or German how they would feel to be classified as "other".

--Should all person of Spanish heritage be lumped together into one large group as a possible solution to the identification problem? What about those of Asian or European heritage?

9. Continue to develop the lesson by brainstorming with students the purpose of accurately defining an individual or groups of individuals under a particular ethnic heading. Why do we need to know this? What is its importance to our society? Possible answers might include:

--It is useful in investigating special requirements of a population in health, education, or other social services. For example, some ethnic groups have higher infant mortality rates than others.

--Identification is demanded by Equal Opportunity and/or Affirmative Action programs. For example, an Italian worker may be promoted because his name was mistaken for Spanish,or a Portugese man might claim Spanish heritage to get a cheaper business loan,or a Spanish person may claim American Indian heritage in order to gain a scholarship to a particular university.

--Problems of unemployment, crime, and educational opportunity faced by particular ethnic groups are often underestimated by inaccurate statistical evidence.

--Federal funding of neighborhood, district, or citywide projects is often determined by the number of persons classified under certain ethnic headings.

Concluding the Lesson

10. Explain that the final part of the lesson will engage students in taking their own census as one way of demonstrating the difficulties that census takers might have in identifying individual membership in various ethnic groups.

NOTE: The time required for this activity can vary, depending on how large an area is to be surveyed and how many questions students decide to ask.

11. Divide the class into small groups of five students each, and distribute copies of "The 1970 Census: What It Will Ask" (Student Materials #3). Included here are a set of steps that each group should follow in this activity:

--Read the questions that are asked on the census form.

--From the form select five to ten questions that the group wishes to answer. At least a few questions should be included that will help to identify the survey respondents' ethnic backgrounds.

--Devise procedures for administering the survey. Each group may wish to survey the same area with different groups working on different questions. In a city, students could study the people in their apartment building; in rural areas, the people who live within a five mile radius; in a small town or city, they might survey their blocks. Each individual in the group should be responsible for completing ten survey forms.

--Conduct the survey.

--Tabulate results. Review the major points about tables before tabulating the results. Present the results so that they can be used by the entire class. The structure of the questions and potential response will determine the form of the table to be used at this stage. Distribute copies of "Sample Table Format" (Student Materials #4) and use it as an example of a table that students might construct to assist them in tabulating their results.

12. After the students have collected the data and presented their findings to the class, conduct a summary discussion of the activity. Questions to be asked could include:

--Were there any problems deciding upon a proper title?

--Were there any problems assigning people to specific categories in the table?

--Did the questions you asked adequately identify the ethnic groups to which the survey respondents belonged?

--How difficult was it to collect your information? Did you have trouble getting the answers from people? If so, why?

--If you had difficulty surveying 50 people, do you think the U.S. Census takers would have similar problems surveying over 200 million people?

13. Conclude by reemphasizing how important it is to take an accurate census. It is used, for example, by government officials to identify important social issues, by politicans to identify needs for new laws, and by demographers to find out how many people there are in a place, how fast the population is growing, what the living conditions are, and so on. You may want to explore with students how other professions such as educators, businessmen, and urban planners make use of the census.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. The opening activity in this module should help students to understand the difficulty that those who gather population information, like the U.S. Census Bureau, have in establishing the proper criteria for defining one's ethnic heritage.

2. The complexities of defining an individual's ethnic heritage results in the Census Bureau omitting certain ethnic sub-groups of the population or else lumping them together into a large group represented under the category of "other".

3. There are many reasons why we need to accurately define an individual or groups of individuals under a particular ethnic heading. The most important include: a) identification is demanded by Equal Opportunity and/or Affirmative Action Programs, b) federal funding of local projects is often determined by ethnic representation, and c) social and educational problems are often underestimated by inaccurate statistical evidence.

4. Presenting census information in a table requires the students to read the table in a systematic sequence: the title, source, footnotes, column and row headings, units of measure, and variability. The strengths of presenting census information in a table include clarity and economy of presenting information in a readily understandable and comparable form.

5. For various reasons it is important for government officials, politicians, demographers, educators, and others to obtain reliable and accurate information about the population.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module:

1. Find old copies of picture magazines such as Ebony, Tan, Life ,and Look. Locate and mount pictures on cardboard of persons who look (a) obviously Caucasian, (b) obviously Negroid, (c) a dark skinned Puerto Rico-American, (d) a fair skinned Afro-American. Ask students to name the "race" of the person in each picture. They will most likely say that one of the pictured persons is "white," and that the other three are "Black or "Negro." Ask, why do we use only two categories to classify the people in these pictures? Explore the difficulty of determining individual's ethnic grouping solely by visual identification. Ask students if they were dark skinned persons from Latin America, whether they would want to be considered "Spanish or Black"? Why?

2. Obtain a copy of Current Population Reports from the U.S. Dept. of Commerce, Bureau of the Census, Government Printing Office, Washington, D.C. Students could go through the reports and identify examples of other subgroups of the population that are not separately classified by the Census Bureau.

3. Another method of determining ethnic identity is to use cemeteries as a source of data. While this may seem to be a strange exercise to many students, it does introduce them to the importance ethnicity plays in the totality of human life and death. Students can work in groups of 3 or 4 either in the same cemetery or different cemeteries. Answers to the following set of questions should be included in their findings:

   --What percentage of tombstones name the country of birth?

   --What ethnic groups can be identified by the type of names found on tombstones?

   --Does the style of tombstone marker differ by ethnic groups? By time period?

   --Where and of what denominations are the nearest churches? Has this been influential in determining who was buried in the cemetery?

--Are there presently any ethnic or religious restrictions for any of the cemeteries in your area?

4. Obtain copies of the 1970 and 1980 census forms and distribute them to the class. Both are available from the U.S. Department of Commerce, Bureau of the Census. Compare the two forms and discuss any differences between them. What might be the reason for these differences? Which do you think will be more accurate, the 1970 or 1980 census? Why?

PROBLEMS: POPULATION DATA STUDENT MATERIALS #1

WHO AM I?

A. Ethnic Heritage (check one or more) Name ____________

1) European

English ________

Scottish _______

German _____

Irish ______

Italian ______

Polish _______

Russian ______

Other ________

2) Asian

Japanese American _______

Chinese American ______

Other ______________

3) Spanish

Mexican American _______

Puerto Rican American ________

Cuban American ________

Other __________

4) Afro American ________

5) American Indian _____

Note: The list above is adapted from categories used by the U.S. Bureau of the Census. They represent the largest ethnic groups in America.

B. The reason(s) for my choice of ethnic heritage is (are): (check one or more)

_________ the languages I speak or read

_________ the type of food I eat

_________ the type of clothes I wear

_________ the origin of my last name (surname)

_________ the ethnic aspects of my home and neighborhood

_________ the religion I belong to

_________ the songs and dances I know

_________ where my ancestors originally came from

_______ the arts and crafts I can do

_______ the holidays I celebrate

Persons of Spanish Origin - Selected Characteristics: 1976

Characteristic	Total	Mexican	Puerto Rican	Other
Total Distribution				
Female . . in 1,000's	11,117	6,590	1,753	2,774
Male . . in 1,000's	5,439	3,285	849	1,305
Total . . in 1,000's	5,678	3,305	904	1,469
Percent Distribution				
Marital Status				
Single	30.6%	30.6%	31.8%	30.1%
Married	60.6%	61.2%	60.1%	59.4%
Widowed	4.1%	4.0%	3.0%	5.2%
Divorced	4.7%	4.3%	5.1%	5.3%
Residence of Families				
Metropolitan areas	83.9%	76.8%	97.4%	90.8%
Nonmetropolitan areas	16.1%	23.2%	2.6%	9.2%

Source: U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the U.S., 1977.

1. What is the title of the table? ____________________

2. List some other titles that may be used to describe the table? ____________________

3. What is the source of the information presented?
____

4. What year is covered by the table? ____________________

5. What is the unit of measure? In what form are the numbers presented? ____________________

6. What ethnic sub-groups of Spanish origin are covered?
____

7. What characteristics of these groups are considered?
____

8. Which groups of Spanish origin persons might come under the category of "other"? ____________________

9. Does the table indicate how the different sub-groups were identified? ____________________

THE 1970 CENSUS: WHAT IT WILL ASK

EVERYONE MUST GIVE THIS INFORMATION:

PERSONAL: Name, sex, race, birth date, marital status (married, widowed, divorced, separated, never married). Are you head of the household, his wife, son, daughter, or relative? Are you a roomer, inmate, or patient living in this house?

ABOUT YOUR HOUSE: Do you have a phone, complete kitchen, hot and cold water, a flush toilet, tub or shower, private entrance? How many rooms? What kind of heating? Is there a basement? Do you own it, rent it, or other? Is it a one-family home? Is it on a big piece of land with commercial business on it too? How much is your property worth; or how much rent do you pay?

A SAMPLING OF PEOPLE MUST ALSO GIVE THIS INFORMATION:

ABOUT THE HEAD OF THE HOUSEHOLD: Where was he born? Where were his mother and father born? What language did he speak as a child? When did he move to his present home? Where did he live in 1965?

How much schooling did he have? How recent? Was he in the armed services? When?

If head-of-household is a woman, how many babies has she had?

If head-of-household is over 16: Did he work last week? How many hours? Where? How did he get there? Was he absent or laid off? Has he looked for work recently? If so, was there any reason he couldn't take a job? When did he last work at all? What kind of job was it? Where did he work in 1965? Did he work at all last year? How many weeks? How much did he earn last year? Was his income from wages? social security? dividends or other?

ABOUT YOUR HOUSE: How old is it? How many families live there? What do you pay for utilities? How big is the lot it's on? How much money did produce from the land earn last year? Where does your water come from? Are you connected to a public sewer? How many bathrooms do you have? How many bedrooms? How many stories is your building? Is there an elevator? What kind of fuel is used? Do you have a second home? Do you have a washing machine, dryer, dishwasher, freezer, air-conditioning, battery-radio, or TV (and does it receive UHF channels)? How many cars do you have?

Source: U.S. Department of Commerce, Bureau of the Census.

SAMPLE TABLE FORMAT

Title

Headings; depending on questions selected.

Cases					
# 1					
# 2					
# 3					
# 4					
# 5					
# 6					
# 7					
# 8					
# 9					
#10					
#11					
#12					
#13					
#14					
#15					
#16					
#17					
#18					
#19					
#20					
#21					
#22					
#23					
#24					
#25					
#26					
#27					
#28					
#29					
#30					
#31					
#32					
#33					
#34					
#35					
#36					
#37					
#38					
#39					
#40					
⇩					
# 50					

Units of Measure: for each question different kinds of answers will be obtained. Some will merely be names and categories, e.g., race or occupation --while others will be numerical in nature, e.g., educational level and average income.

Source: describe survey; Who? When? Where? How large a sample?

Footnotes: any additional information to help clarify the table.

U.S. POPULATION: WHERE ARE THE PEOPLE GOING?

A module for teaching middle school students about
current U.S. migration patterns and the effects
of population change with the aid
of quantitative concepts

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Supplementary Teacher Materials

1. Causes of Population Distribution (Answer Sheet)

Student Materials

1. Population Totals and Percent Changes by States, 1970-1980.
2. Causes of Population Distribution
3. Case Study, Boom in the South

OVERVIEW OF THE MODULE

Introduction

Population growth in the U.S. has leveled off recently to less than 1% per year; however certain regions of the country, notably the South and West, are growing at a rate much faster than the national average. What are the causes of this rapid growth? What are the implications for the shaping of national policy? Will population growth in these regions lead to a major shift in American economic and political power? What are the immediate effects of rapid growth on a particular area? Students will explore these questions by comparing and discussing data from several sources as they are presented in tables and a reading. Upon completion of the module students should understand some aspects of population changes in the United States. Students should also understand that what happens in one area of the country may have an impact on another area.

Description of Materials

Courses and Topics:

Current Social Problems: Population growth and distribution and regional differences.

American Government: Environmental issues, growth vs. no growth theory, and policy planning.

American History: Contemporary economic and social trends and population distribution.

Grade Level:

7-9: (basic activities).

10-12: With suggested activities for advanced students, the starred (**) items.

Time Required: One or two class periods.

Concepts and Skills:

Social Studies Concepts: Migration, population distribution, and effects of population change.

Quantitative Concepts: Tables and average (median).

Thinking Skills: Interpreting and comparing.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Identify U.S. migration patterns, 1970-1980.
2. Calculate the median percent change in population from 1970-1980 for regions of the United States.
3. Compare differences in regional population growth and identify some reasons for these differences.
4. Recognize the effects of rapid growth on a particular region or area.

Sources of Data:

The source of the data on percent changes in population totals by states was Current Population Reports, series p-25. The 1978 edition of the Statistical Abstract of the United States was the source of data for percent changes in personal income by states. Both are published by the U.S. Department of Commerce, Bureau of the Census. The source of data on unemployment rates by state was Employment and Earnings, a monthly publication of the U.S. Department of Labor, Bureau of Labor Statistics. Examples of the impact of rapid growth on particular regions may be found in various news magazines and newspapers.

LESSON 1: U.S. MIGRATION PATTERNS

Introducing the Lesson

1. Introduce the idea of mobility in American society by inquiring of students how many have been in the same school system since the first grade. The number will vary according to the school system, but if only a small number of students have been in the same system since grade one, it would not be unusual given the high rate of mobility in American life. Last year, for example, the U.S. Census Bureau estimated that over 40 million people moved from one location to another.

2. With the assistance of those students who have moved with their families, develop a list of reasons why people move, and write this list on the blackboard. Ask other students in the class to supplement the list with as many additional reasons as they can think of. Possible reasons might include: job transfer, employment opportunities, age, climate, less crime and congestion, more relaxed life style, lower taxes, higher standard of living, and simply a sense of adventure and freedom. Keep this list on the board for future reference.

Developing the Lesson

3. Explain to students that one way to determine the migration patterns of Americans during the 1970's --that is, the most popular areas to which people are moving--is with the data presented in "Population Totals and Percent Changes by States, 1970-1980" (Student Materials #1). This can be done by having students calculate, using the percent changes in population by states, the MEDIAN percent change for each region. At this point in the module, a map of the United States would be a useful tool to include as a means of assisting students in the evaluation of this data. Have students calculate the median percent change for each region.

MEDIAN is the midpoint of a distribution of scores or a set of numbers. By using MEDIAN as a measure of average, we will not be able to determine the exact percentage change in population for each region. It is, however, the best measure of typicalness or central tendency we can use for this exercise because it is not as affected by extremely high or low changes.

The MEDIAN percent change in population for each region in Student Materials #1 is the point where half of the percent changes in each region are above and half are below. Thus, for example, if we distributed from top to bottom the percent changes in population for states in the Northeast region, the MEDIAN would be 4.4% as shown below:

New Hampshire	Up 18.6%	
Maine	Up 12.3%	
Vermont	Up 11.0%	
Connecticut	Up 5.2%	
Massachusetts	Up 4.4%	— Median = 4.4%
New Jersey	Up 2.9%	
Pennsylvania	Up 1.6%	
New York	Up 0.2%	
Rhode Island	Up 0.1%	

The MEDIAN is not always one of the scores in the distribution (as it was in the previous distribution). If, for example, we removed Rhode Island from the list, the MEDIAN would be 4.8%--the point where half the percent changes are above and half are below:

New Hampshire	Up 18.6%	
Maine	Up 12.3%	
Vermont	Up 11.0%	
Connecticut	Up 5.2%	
		—— Median = 4.8%
Massachusetts	Up 4.4%	
New Jersey	Up 2.9%	
Pennsylvania	Up 1.6%	
New York	Up 0.2%	

This happens when you have an even number of scores (in this case eight). For the difference between MEDIAN and other measures of average, see the module, "What Americans Earn."

4. Based on student calculations and the data in Student Materials #1, ask:

--What is the median percent change in population for each region? In the Northeast region it is 4.4%, the North Central region is 4.8%, the South is 11.0%, and the West is 22.2%.

--Which regions have a median percent change above the percent change for the United States? The South and West.

--Which regions have a median percent change below that of the United States? The Northeast and North Central regions.

--Are there any states different from most other states in the regions with below average percent changes in population? Yes. Which? New Hampshire, Maine, and Vermont in the Northeast and Wisconsin in the North Central.

--Do these states have any common characteristics which might account for the difference? Yes, these are rural states which have benefitted from a "back to the country" movement on the part of young people. Also, these states do not have large populations. Thus, a relatively small increase in absolute figures causes a higher percent change compared to other states in the region.

--Are there any states different from most other states in the regions with above average percent changes in population? Yes. Which? Florida and Arizona show exceptionally high rates of growth while Washington and West Virginia fall well below the median for their respective regions.

--Do these states have any common characteristics which account for the difference? Yes, Florida and Arizona are warm weather, "sunshine states" that attract a large number of retired people or those with health problems. Washington and West Virginia have a history of unemployment, West Virginia in the coal industry and Wasington in the aircraft industry.

5. Emphasize that migration patterns of Americans during the 1970's account for most of the increase in population in the South and West, the two regions with percent changes in population above the national average. With the list compiled in the opening activity as a reference, and a more to speculate about why Americans are migrating to these regions. Besides climate and job opportunities, students might mention factors such as increased prosperity, lower taxes and a more relaxed life style in the South; and better schools, less crime, and less congestion in the West.

6. Further explore some of the reasons for current migration to the South and West by distributing "Causes of Population Distribution?" (Student Materials #2). The set of questions that precede the data will help focus student investigation of the data and their importance. An answer sheet is provided in Teacher Supplemental #1.

7. After the students have completed the worksheet, the following questions may be used to summarize their findings:

   --Does the data help to explain the reasons for population movement to the South and West? Why or Why not? Yes. Most students should notice that the median unemployment rate in the South and West are below the national average, while median growth in personal income in the two regions is well above the national average.

   NOTE: Make sure to probe with students any of the exceptions to the data. For example, although the median unemployment rate for the South and West is lower than the national average, the median unemployment rate for the North Central region is also lower than the national average and lower even than in the South and West.

   --What additional information might have been included to help determine why population growth is occurring in the South and West? Data on cost of living, crime rates, social and environmental conditions, and state income and property tax rates.

NOTE: Data on the environment, social climate, and committment to health and education of individual states is difficult to obtain. These gaps in information may be partially filled with data from a study carried out by Ben-Chieh Lieu, Quality of Life in the U.S. Metropolitan Area, 1970, which ranks individual cities by various categories. While this data does not give us a composite picture of each state, it may assist students in determining other causes of population movement to the South and West.

Concluding the Lesson

**8. Explain to students that rapid population growth in particular regions can bring about increased political and economic opportunities but may cause severe problems as well. Distribute the case study, "Boom in the South" (Student Materials #3). Have students read the case study and then elicit student response to the following questions:

--What is meant by growth? Growth of what? Growth does not mean only population growth. It can also mean growth in jobs, housing, highways, and demand for services.

--Is the speed or rate of growth in a particular area important? Yes. If so, why? If growth occurs too rapidly, proper planning cannot take place, and environmental and social decay may set in as a result.

--According to the article, what are the positive and negative consequence of growth. Positive consequences may be more jobs, better business opportunities, higher incomes, and general prosperity. Negative consequences may be congested housing and traffic conditions, environmental decay, soaring housing costs, power failure and brownouts, and growing scarcity and cost of land.

--In a democratic society, can growth be limited? Yes, but it is difficult if not impossible to restrict the movement of people. How? What are some examples from the article? Changing zoning laws, limiting tax breaks for the elderly, restricting new industry, creating historical districts, and city purchasing of open space areas.

--Which interest groups would be most opposed to a limited growth policy? Developers, manufacturing and construction workers, labor unions, builders, engineers, suppliers of building materials, etc.

9. Conclude the discussion and the module by focusing on current migration patterns in the United States and on whether rapid population growth is good or bad for any particular region.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. MEDIAN (the midpoint of a distribution of scores or a set of numbers) is the major quantitative concept emphasized in this module. While it does not give us an exact average percent change in population for each region, it is the best means of typicalness or central tendency we can use for the module because it is not as affected by extremely high or low percent changes in states with unequal populations.

2. The South and West regions of the United States are growing faster in population than others and this is primarily due to the migration patterns of Americans during the 1970s. The reasons why people are migrating to these regions include climate, employment opportunities, lower taxes, lower cost of living, less crime, less congestion, and a more relaxed life style. Examination of the data from Student Materials #2 should tend to confirm the reasons behind increased migration to the South and West but also lead to a discussion of other data that would be useful in determining why growth is occurring in these regions.

3. Rapid population growth in a particular region brings its own set of positive and negative consequences. The facts and figures from the reading in Student Materials #3 should stimulate student thinking about the meaning of growth, whether growth should occur or not, and how growth can be controlled in a democratic society.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Obtain the film, Population and the American Future (60 min., 16mm, color, 1972) on free loan from Modern Talking Pictures, 2323 New Hyde Park Road, New Hyde Park, New York 10040. This is the official film version of the Report of the Commission of Population Growth. The film can stimulate useful inquiry into the implications of population growth and distribution and encourage discussion of policies designed to influence them. A comprehensive study guide to the film is available from the Population Reference Bureau, 734 15th Street, N.W., Washington, D.C. 20005.

2. To highlight the importance of age and family status as factors in population distribution, ask students to try to guess where they will be living, and why, in ten years. Students should try to guess where their parents will be living, and why, in ten years. Encourage students to clarify the reasons for these estimations. Make sure to stress the importance of one's stage in the life cycle as a factor in deciding where to live.

3. Teachers should be aware of the fact that state departments of vital statistics have data by geographical area on fertility, mortality (by cause) and morbidity (by disease). Students can learn a great deal by mapping and discussing this data, as the rates can vary widely from place to place.

**4. For the implications of population growth on water supplies and distribution in the Southwest and Far West see Newsweek Magazine, June 12, 1978, "Western Water Fight," pp. 53-55. The article includes a chart which illustrates the increasing demands made on the Colorado River.

**5. Teachers can create a maxtrix such as the following example:

Population Event	Areas of Social Consequence			
	Housing	School Enrollment	Taxes	Local Business
1) A community college is built on the outskirts of your town. Present enrollment will jump from 1500 students to at least 5000 within 10 years.				
2) High school graduates in your town move away to large cities. Few young families move in to replace them.				
3) Your small town gains an average of 1000 new residents a year in each of the past 5 years for a total population gain of 5000.				
4) A local canning company, employing 255 people, decides to move to another state, taking all of their current employees with them.				

Hand out a copy of the matrix to the students and allow them sufficient time to fill in the spaces under the "social consequences" headings. The exercise should provide teachers and students with a sense of whether or not students grasp the concept of "effects of population change."

CAUSES OF POPULATION DISTRIBUTION?
(Answer Sheet)

1. Which state has the lowest unemployment rate? Wyoming.

2. What is the median unemployment rate for each of the following regions?

Northeast	(6.6)	North Central	(4.55)
South	(5.7)	West	(5.5)

3. Which region has the widest range in unemployment rates? The West.

4. Why do you think the U.S. Department of Labor reports unemployment in "percentage of labor force" rather than in "percentage of total population" or "total number of unemployed persons"? Labor force identifies those people who are capable of being employed; using percent of total population would make comparison difficult because some states might have more retired people or children who are not part of the labor force. Using percentages rather than total numbers makes comparison easier. The states with the largest populations would appear to be the worst if totals were used, even though the chances of being unemployed in those states might be less than in states with smaller populations.

5. In which state did personal income grow the least from 1970-77? New York. In which did it grow the most? Alaska.

6. In which of the two states in the answer to question 5 would you have the better chance of being unemployed? Alaska.

7. Florida and Arizona were previously identified as the fastest growing states in the South and West respectively. How do these states rate on unemployment and personal income? (Florida, 6.6% unemployment, 47% growth in personal income; Arizona, 5.5% unemployment, 51.5% growth in personal income.

8. Why is it important to consider both unemployment rates and growth in personal income? If the state has a high rate of growth in personal income but also a high unemployment rate, it might be more risky to move there in search of a job. On the other hand, moving to a state with a low unemployment rate may mean that you would earn less than in other states.

9. What is the median growth in personal income in each of the following regions?

Northeast (14.0%)
South (36.5%)
North Central (27.0%)
West (44.0%)

POPULATION TOTALS AND PERCENT CHANGES BY STATES, 1970-1980

	1970 Population	1980 Population	Median % Change
NORTHEAST			
Connecticut	3,041,000	3,200,000	Up 5.2%
Maine	997,000	1,120,000	Up 12.3%
Massachusetts	5,706,000	5,955,000	Up 4.4%
New Hampshire	742,000	880,000	Up 18.6%
New Jersey	7,193,000	7,400,000	Up 2.9%
New York	18,268,000	18,300,000	Up 0.2%
Pennsylvania	11,813,000	12,000,000	Up 1.6%
Rhode Island	951,000	950,000	Down 0.1%
Vermont	446,000	495,000	Up 11.0%
NORTH CENTRAL			Median % Change
Illinois	11,128,000	11,350,000	Up 2.0%
Indiana	5,202,000	5,450,000	Up 4.8%
Iowa	2,832,000	2,900,000	Up 2.4%
Kansas	2,249,000	2,300,000	Up 2.3%
Michigan	8,890,000	9,500,000	Up 6.9%
Minnesota	3,815,000	4,000,000	Up 4.8%
Missouri	4,688,000	4,840,000	Up 3.2%
Nebraska	1,488,000	1,600,000	Up 7.5%
North Dakota	620,000	660,000	Up 6.5%
Ohio	10,664,000	10,900,000	Up 2.2%
South Dakota	668,000	700,000	Up 4.8%
Wisconsin	4,429,000	4,800,000	Up 8.4%
SOUTH			Median % Change
Alabama	3,451,000	3,800,000	Up 10.1%
Arkansas	1,932,000	2,300,000	Up 19.0%
Delaware	551,000	600,000	Up 8.9%
D.C.	756,000	700,000	Down 7.4%
Florida	6,848,000	9,600,000	Up 40.2%
Georgia	4,607,000	5,200,000	Up 12.9%
Kentucky	3,231,000	3,550,000	Up 9.9%
Louisiana	3,652,000	3,950,000	Up 8.2%
Maryland	3,938,000	4,200,000	Up 6.7%
Mississippi	2,220,000	2,450,000	Up 10.4%
North Carolina	5,098,000	5,800,000	Up 13.8%
Oklahoma	2,567,000	2,850,000	Up 11.0%
South Carolina	2,597,000	3,000,000	Up 15.5%
Tennessee	3,937,000	4,400,000	Up 11.8%
Texas	11,236,000	13,200,000	Up 17.5%
Virginia	4,659,000	5,250,000	Up 12.7%
West Virginia	1,751,000	1,850,000	Up 5.7%

POPULATION TOTALS AND PERCENT CHANGES BY STATES

(Continued)

	1970 Population	1980 Population	Median % Change
WEST			
Alaska	304,000	400,000	Up 31.6%
Arizona	1,792,000	2,600,000	Up 45.1%
California	20,007,000	22,400,000	Up 12.0%
Colorado	2,223,000	2,650,000	Up 19.2%
Hawaii	774,000	950,000	Up 22.7%
Idaho	718,000	900,000	Up 25.3%
Montana	698,000	800,000	Up 14.6%
Nevada	493,000	680,000	Up 37.9%
New Mexico	1,023,000	1,250,000	Up 22.2%
Oregon	2,101,000	2,450,000	Up 16.6%
Utah	1,066,000	1,320,000	Up 23.8%
Washington	3,413,000	3,700,000	Up 8.4%
Wyoming	334,000	400,000	Up 19.8%
UNITED STATES	203,810,000	222,500,000	Up 9.2%

Source: U. S. Department of Commerce, Bureau of the Census, Current Population Reports, series p-25.

Causes of Population Distribution?

Listed below are some questions to guide you in looking at the information included in the following tables. Remember these points about reading tables as you answer the questions:

1. Title. A good title should state precisely what information is contained in the table. A title such as "Percent of Labor Force Unemployed (July, 1978)" is, therefore, more helpful than a title such as "Unemployment Pattern."

2. Source. Every table should identify its source of information. "Is the source reliable?" is a question that should always be asked. Does the source report how and when the data presented in the table was gathered? If we don't know how and when the data was collected then it may be difficult to judge how reliable the data is.

3. Footnotes. Footnotes supply additional information which you may need to know to read the table accurately.

4. Column and Row Headings. The headings provide additional detail on the type of information presented in the table. In Table A the headings clearly show that the unemployment rate is reported by individual states.

5. Units of Measure. Tables are often misread because people do not identify the kind of information being reported. In Table A the unit of measure is percentage of labor force. Some other units of measure might have been: 1) total number of unemployed people, 2) number of people receiving unemployment insurance, or 3) percentage of total population.

6. Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending upon the task at hand, the reader might wish to look for variability between places, between occupational categories, between years, or some combination of these.

QUESTIONS

1. Which state has the lowest unemployment rate?

   ____

2. What is the median unemployment rate for each of the four regions?

   ____

3. Which region has the widest range in unemployment rates?

   ____

4. Why do you think the U.S. Department of Labor reports unemployment in "percentage of labor force" rather than in "percentage of total population" or "total number of unemployed persons"?

   ____

5. In which state did personal income grow the least from 1970-77? In which did it grow the most?

   ____

6. In which of the two states in the answer to question 5 would you have the better chance of being unemployed?

   ____

7. Florida and Arizona were previously identified as the fastest growing states in the South and West respectively. How do these states rate on unemployment and personal income?

   ____

8. Why is it important to consider both unemployment rates and growth in personal income?

____

9. What is the median growth in personal income in each of the four regions?

____

Table A

STATE UNEMPLOYMENT DATA--PERCENT OF LABOR FORCE UNEMPLOYED (JULY, 1978)

Total U.S. Unemployment Rate = 6.2%

I. Northeast

State	Unemployment Rate (%)
Connecticut	4.5
Maine	6.6
Massachusetts	6.3
New Hampshire	5.2
New Jersey	7.9
New York	7.6
Pennsylvania	7.3
Rhode Island	6.9
Vermont	4.9

II. North Central

State	Unemployment Rate (%)
Illinois	6.4
Indiana	5.6
Iowa	3.7
Kansas	3.2
Michigan	7.3
Minnesota	3.7
Missouri	5.1
Nebraska	2.8
North Dakota	4.0
Ohio	5.3
South Dakota	3.3
Wisconsin	5.1

III. South

State	Unemployment Rate (%)
Alabama	5.6
Arkansas	5.7
Delaware	9.8
Wash., D.C.	9.5
Florida	6.6
Georgia	6.4
Kentucky	5.3
Louisiana	7.3
Maryland	4.9
Mississippi	8.2
North Carolina	4.5
Oklahoma	3.9
South Carolina	6.3
Tennessee	6.8
Texas	5.2
Virginia	5.3
West Virginia	5.7

IV. WEST

State	Unemployment Rate (%)
Alaska	9.3
Arizona	5.5
California	7.0
Colorado	5.1
Hawaii	7.6
Idaho	4.8
Montana	5.9
Nevada	4.0
New Mexico	5.5
Oregon	5.6
Utah	3.6
Washington	6.3
Wyoming	2.7

Source: U.S. Dept. of Labor, Bureau of Labor Statistics, Employment and Earnings, October, 1978.

Table B

PERCENT GROWTH IN PERSONAL INCOMES BY STATES, 1970-77
(in constant 1972 dollars)

Total U.S. Average = 25%

I. Northeast

State	% Growth in Personal Income
Connecticut	11
Maine	26
Massachusetts	13
New Hampshire	30
New Jersey	14
New York	5.5
Pennsylvania	13.5
Rhode Island	12.5
Vermont	17.5

II. North Central

State	% Growth in Personal Income
Illinois	16
Indiana	
Iowa	27
Kansas	30
Michigan	27
Minnesota	27
Missouri	22
Nebraska	27
North Dakota	38
Ohio	18.5
South Dakota	32
Wisconsin	28

III. South

State	% Growth in Personal Income
Alabama	36
Arkansas	45
Delaware	18.5
Washington, D.C.	16
Florida	47
Georgia	32
Kentucky	36.5
Louisiana	39
Maryland	22.5
Mississippi	39
North Carolina	32.5
Oklahoma	36.5
South Carolina	38.5
Tennessee	35
Texas	45.5
Virginia	35.5
West Virginia	38.5

IV. West

State	% Growth in Personal Income
Alaska	107
Arizona	51.5
California	29
Colorado	44.5
Hawaii	26
Idaho	44
Montana	27
Nevada	50
New Mexico	47
Oregon	42
Utah	43
Washington	32.5
Wyoming	69

Source: U.S. Dept. of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1978.

CASE STUDY: BOOM IN THE SOUTH

Six thousand people each week come here to live. They come for the sun, the water, and good business opportunities. Many of them first came on visits as tourists. Now they are returning--some to work and some to retire.

This is a description of what is happening on a 100 mile strip of land along the coastline in one of our southern states. This part of the state is showing great prosperity. Building is booming; the rate of new housing, office, and highway construction is increasing. The outlook for the future is good with unemployment at less than three percent, and new jobs are being created every day.

But this pleasant outlook might be hiding a disastrous future. The growth may be too rapid. It may lead to a serious decline in the quality of life. 2.5 million people are currently living here. This population will increase to 3 million by 1980, and by the year 2000 it will be nearly 6 million.

What will such a large population do to the area's environment?

Supplies of water and energy will certainly be strained. Problems will increase in a number of areas: sewage disposal, traffic, pollution, and overcrowding. Everyone from businesspeople to those who enjoy the outdoors is affected by the rapid growth and the shrinking open space.

Buildings are replacing scenic views. Beaches are being paved over. New cities are being built overnight. Hundreds of thousands of people are moving into the high rise complexes which are taking the place of beaches and agricultural lands.

Not everyone is happy about this uncontrolled growth. Those who have lived here for several years are hostile toward the ten to thirty story buildings which now stand in the way of what used to be scenic views.

One large area within the 100 mile strip is experiencing conflict between those who favor growth and those who want growth limited. Some people claim that better planning is all that is needed to avoid serious problems, and a new land-use plan for the area has been developed. The sewage system, which is currently at peak capacity, is being rebuilt. In addition, plans are being drawn up for a new rapid transit system. Such a system will cost as much as 800 million dollars.

Water is one of the most serious problems. Even nearby lakes and swamps are drying up. Yet there are no restrictions on water usage except during severe droughts. Some particularly pessimistic analysts believe that by 1935 water will have to be distilled from sewage to meet the population's needs.

Power poses still another serious problem. Already there have been several brief power failures in the area. To meet the needs of the growing population, the power and light company is currently building several new power plants. The costs for such construction are over a million dollars a day.

Consider these figures for the past 15 years:

--The population has grown by nearly 70 percent.

--The number of automobiles has increased by over 100 percent.

--The consumption of gasoline has increased by over 150 percent.

--The consumption of electricity has increased by over 300 percent.

--Shortages have been experienced in the supply of gasoline and other petroleum products.

All of this is placing a great strain on the area's ecology. One ecologist claims that the only solution is to move people--about 250,000 of them--out of the area.

Several means of limiting growth are being explored. One proposal would limit high-density (apartment complex) development, another would restrict new industry, a third is to stop all building for a six-month period. One city in the area has put a limit on the number of dwelling units allowed within the city limits, and other cities have passed laws restricting the population density.

Despite all the frightening predictions, there are still some people in the area who believe the growth is beneficial. The president of a large development corporation, for example, sees the boom as an opportunity to employ new environmentally sound planning and building techniques. His company builds community-sized developments, including homes, apartments, businesses, office buildings, shopping centers, hotels, and hospitals. In one such community they were able to preserve 90 percent of the natural forest which was on the site prior to development. In another, treated sewage is used for watering golf courses.

Another happy booster is the president of a large brick and supply company. His company has grown rapidly, as have his profits. In only two years the company's sales have climbed nearly ten million dollars. "The thing we worry most about is a shortage of any kind of building supply," he says. "This place will continue to grow because it is a nice place to live. People like the climate and the location. Besides, growth is what this country is all about!"

INCOME -- HIS AND HERS

A module for teaching high
school students about income
with the aid of quantitative concepts.

Project QUESST
Boulder, Colorado
August, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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INCOME--HIS AND HERS

OVERVIEW OF THE MODULE

Introduction

What does the average man, employed full-time, earn in a year? What does the average women earn? Do men and women in similar occupational categories, like lawyer or sales-worker, earn similar annual amounts? This module explores the extent to which earnings are different for men and women, and the reasons for those differences. The module also explores reasons for differences in earnings between different occupations and between different geographic regions. The module introduces students to the concept of median and to the use of tables and graphs.

Changes in earning differentials between men and women, and among different occupations and geographic regions, may give students insights into important social and economic changes. Students may also be interested in information about earnings and changes in earning patterns as a factor in making career choices.

Description of Materials

Courses and Topics:

Economics: Income distribution and wages.

Sociology: Sex roles and discrimination.

U. S. History: Contemporary social and economic issues.

Grade Level:

7-9 basic activity.

10-12 with suggested activities for advanced students, the starred (**) items.

Time Required: Two class periods.

Concepts and Skills:

Social Studies Concepts: Income distribution , sex roles, and discrimination.

Quantitative Concepts: Average (median), tables, and bar graphs.

Thinking Skills: Analyzing, inferring, and hypothesizing.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Compare the average incomes of males and females by occupational category.
2. Hypothesize reasons for income differences between males and females.
3. Define and use the median as a measure of average.

Sources of Data:

The 1977 edition of the Statistical Abstract of the United States was the source of the data presented in this module. The Abstract is published annually by the Bureau of the Census, Department of Commerce.

LESSON 1: HIS AND HERS

Introducing the Lesson

1. Distribute "Superiority?" (Student Materials #1), and allow students a few minutes to look at it.

   Note: To focus students' attention, you may want to make a transparency of Student Materials #1 to use with an overhead projector.

2. Stimulate widespread student reaction by asking what the graphs "prove." After a number of comments have been made by students, some points to emphasize include:

   --Do the graphs seem realistic, based on students' personal experience? Do their relatives, friends, and classmates fit the pattern shown in the two graphs? Obviously, no.

   --Is the data source reliable? What types of tests? Are the tests valid and reliable? How many people were tested--one of each sex or 1,000 of each sex? Who collected and reported the information? We don't know. We do not have any of the necessary information presented in the footnotes of the graphs to answer these important questions.

3. Indicate that, as students should have guessed, the data are not true, are not based on fact. However, the data to be presented next are true, and raise some interesting questions for discussion and thought. Before continuing, you may wish to discuss with the class a few brief points, including:

   --How many students were ready to believe the data? Why?

   --Did male students react differently to the data than did female students? Why?

Developing the Lesson

4. Distribute "What We Earn" (Student Materials #2) and allow students a few minutes to read it.

Note: The median, one measure of average, is used in this module to describe average income. Median will be defined for the students in step 7. For the moment they can discuss Student Materials #2 knowing only that median is the common measure of average income used by the U.S. Government.

5. Elicit student response by asking such questions as:

--How does the average (median) earnings bar graph differ from those on performance and aptitude? The proportions of the bar graphs are similar. However, the earnings data are true whereas the performance and aptitude graphs were completely fictitious.

--What is the difference in average (median) earnings between men and women in the United States? $13,455-$8,099 = $5,356 or approximately five thousand dollars. Another way of stating the difference is that women, on the average, earn only 60% as much as do men.

--In which geographic region do women earn the highest average (median) income? the lowest? what about men? For women, the high was $8,270 in the Middle Atlantic states and the low was $6,542 in the West South Central States. For men, the high was $14,281 in the Pacific States and the low was $11,586--also in the West South Central region. The point to be emphasized here is that the national difference between the incomes of males and females also holds true within different geographic regions of the country. In all eight regions, men average a higher income than do women. Proportionally, women do best in the Middle Atlantic States where their earnings average 63% that of their male counterparts. Women, on the average, do worst in the West South Central States where they earn only 57% as much as do male workers in the region.

--Does this disparity in the earnings of men and women seem fair? Before we answer, we would have to define what we mean by fair. Most reasonable people would agree that equal pay for equal work would be fair. The question of fairness may then become one of access to employment. Equal pay for being a carpenter, electrician, medical doctor, and physicist means little if unions block women from trades, and if schools and parents steer women away from the math and science courses that are prerequisites for many professional careers. The "fairness" question is then more complex than might first appear to be the case.

6. Note for students that Student Materials #2 indicated that both nation-wide and within separate geographic regions of the nation, women, on the average, earn proportionally less than do men. Ask students if they think that similar differences in the average earnings of men and women are also found in different types of occupations, or do they think there are some occupations where women's and men's average earnings are more equal?

7. Distribute "Average Earnings" (Student Materials #3). Note that the average used is the MEDIAN. The median is defined as the mid-point in a set or array of numbers, the point above which are half of the numbers and below which are half of the numbers.

The median is the mid-point. With an odd number of cases (example a), the median is the middle number or score. With an even number of cases (example b), the median is not an actual score or number in the array. With an even number of cases, the median falls between the two middle numbers.

a		b	
$500		$560	
$670		$690	
$720	-- Median	$700	-- Median
$880		$725	
$975		$860	
		$940	

8. You can distinguish the median from other measures of average at this point. Indicate to students that:

--The MEDIAN is the mid-point in a set of data. A major strength of the median is that it is not affected by extremely high or low scores. The median is a good representative average. A weakness of the median is that all scores have to be placed in rank-order in order to identify the actual mid-point.

--The MEAN is the arithmetic average, i.e., the sum of the scores divided by the total number of scores. A major strength of the mean is that it takes into account all scores. The mean is the most commonly used measure of average. A weakness of the mean is that it is more affected by extreme scores than is the median.

--The MODE is the score or number recorded most often. The mode is the most characteristic score observed in a set of data. A strength of the mode is that it is a measure of the most typical or common. A weakness of the mode is that it does not necessarily fall near the center of a set of data.

All three measures of average are good representations of average or central tendency in example a. In example b, the median is the best measure of average. In example b, the mean has been affected by the extremely high score and the two modes do do not fall near the center of the data.

a		b
$ 900		$ 900
$1,000		$ 900
$1,000		$1,000
$1,100		$1,100
$1,200		$1,200
$1,250		$1,200
$1,300		$2,400
$1,107	--Mean--	$1,243
$1,100	--Median--	$1,100
$1,000	--Mode--	$ 900 and $1,200

9. Elicit student analysis of the information in Student Materials #2 and #3 by asking:

Note: Examples of specific jobs which fall under each occupational category are provided in an information sheet--Teacher Supplemental #1.

--What general conclusion may be drawn from the data presented in Student Materials #2? On the average, the median earnings of females is proportionally lower than that of males in all eight major geographic regions of the United States.

--What general conclusion may be drawn from the data presented in Student Materials #3? On the average, the median earnings of females is proportionally lower than that of males in all nine major occupational categories reported by U.S. government data.

--How does the highest median earnings of females in all categories compare to the median earnings of males? The highest median earnings for females ($11,072--Professional/Technical) is actually lower than the median earnings of males in six out of nine categories.

--Proportionally (on a percentage basis), in which occupational category are women the most equal? The least equal? Women are most equal in the non-farm labor category where their median earnings are 75% that of men. Women are least equal in the salesworker category where their average is only 43% that of men. In only three of nine occupational categories do women's median earnings exceed 2/3 (66%) that of men.

10. On the chalkboard, draw the two axes for making a graph. The vertical axis should be median earnings and the horizontal axis should be occupational categories. For the first occupational category (Professional/Technical), draw in the bars for males and females.

Note: A completed graph, an answer sheet, is provided in Teacher Supplemental #2.

11. Have students draw in the bars representing the salaries of males and females for the remaining eight occupational categories. Emphasize the following points:

--The bar graph presents the same general information as did the table.

--Compared to the table, one strength of the bar graph is that it presents a strong visual image of the proportional differences in earnings.

--A weakness of some bar graphs is that they do not include the actual figures with the bars. For such a case, one could say that professional men earn approximately $17,000 rather than that they earn $16,939. Placing the actual figures within or above the bars strengthens the informational aspect of the graph though it may clutter the visual image.

** 12. With advanced students or classes, you may wish to "brainstorm" and discuss some of the reasons (causes) why women, on the average, earn less than do men. Reasons could include:

--Long and short term historical trends. For example, most occupational groups are male-dominated and emphasize the role of the male as family head and breadwinner.

--Social expectations. The primary role of the woman is seen in many societies as housekeeper and childbearer.

--Social customs and mores. Similar to the first two points, many societies view the working woman as an indicator of the failure of the male to support the family rather than as fulfillment of some desire of the female.

--Educational background. In many cases, parents and school personnel persuade females that math, the sciences, and industrial arts are for males only. The female entering college or a trade without adequate preparation and skills finds many lucrative fields closed to her--e.g., science, engineering, the computer field, medicine, and many skilled trades.

--Laws. In many cases laws and local ordinances have kept women from certain jobs. Company and union practices have also been very effective in shutting women out of many occupations.

--Even though many laws and practices have changed, e.g., affirmative action programs, there has been a cultural and attitudinal lag. Many people still accept and implement practices which foster differences in earnings, despite changes in law, regulations, and rhetoric.

The two federal laws which deal with sex discrimination are the Equal Pay Act of 1963 and Title VII of the 1964 Civil Rights Act. These laws state that men and women must be paid equally for equal work, and hired and promoted equally.

**13. With advanced students or classes you may wish to "brainstorm" and discuss forces that are bringing women into the workforce. Workforce being defined as being employed outside the home and receiving some salary for the work done. Points to be made could include:

--The economic necessity to achieve a living standard above the poverty level, and based on one's own skill and earning power.

--The economic desire of a couple to have two incomes to achieve a higher living standard.

--The increased divorce rate, leading to more single persons and single-parent families.

--The desire of many women to enjoy the financial and personal fulfillment that a career may bring.

Concluding the Lesson

14 Have students identify occupations that they would like to enter. Place students with similar occupational choices in small groups. Have groups answer the following questions:

--What average annual salary would students expect to earn in their chosen occupations?

--To prepare for the occupation, what type of classes should be taken in high school?

--Do you need a college degree to enter the occupation?

--Do you need to attend a trade school to enter the occupation?

--Do you need advanced college degrees to succeed in in the occupation?

--Do you need to join a union to enter the occupation?

--How much competition for jobs is there in your chosen occupation?

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. The MEDIAN (the midpoint in a series of scores or figures) is a common measure of average income. The median, rather than the mean, is commonly used with income data because the median is not affected by extreme scores.
2. On the average, women earn proportionally less than men in all geographic regions of the country and within all major occupational categories.
3. In general, women have lower incomes because they are employed in lower-paying occupations. For example, women tend to be employed as public school teachers rather than as administrators or college professors, women tend to be nurses rather than doctors, and women tend to be employed as office help rather than as skilled craftsworkers.
4. In general, for given occupations, women tend to earn less than do men performing similar tasks. In this case, discrimination may well be the root of the earning difference.
5. No matter what occupation they enter, and no matter what part of the country they live in, women will (on the average) earn less than will their male counterparts. Of course, there are exceptions and, as attitudes and practices change, there may be more equality between the sexes in average earnings.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Conduct a class survey. How many students' mothers and fathers are employed outside the home. You might have students write the occupations of their parents on a piece of paper, collect the papers anonymously, and record the results on the chalkboard. How many of the nine occupational categories are represented?
2. Invite a professional career counselor to talk to the class and address such points as: What appear to be the promising career fields over the next few years; the unpromising career areas? What type of secondary school classes should be taken?
3. Conduct a community survey of attitudes toward women entering the work force. Is there a difference between the attitudes of male and female respondents?

SUPPLEMENTARY TEACHER
MATERIALS #1
(Information Sheet)

OCCUPATIONAL CATEGORIES

1. Professional and Technical include: accountants, architects, engineers, lawyers, doctors, scientists, teachers, writers, entertainers, religious workers, librarians, computer specialists, etc.

2. Managers and Administrators include: school administrators, wholesale and retail store administrators, public administrators, buyers and purchasing agents, etc.

3. Salesworkers include: insurance and real estate agents, wholesale and store sales clerks, demonstrators, etc.

4. Clerical Workers include: bookkeepers, cashiers, receptionists, secretaries, office machine operators, file clerks, timekeepers, etc.

5. Craft and Kindred Workers include: mechanics, machinists, construction trades, bakers, apparel makers, printers, locomotive engineers, etc.

6. Operatives include: bus and taxi drivers, truckers, assemblers, inspectors, butchers, seamstress and tailors, launderer, bottlers and canners, etc.

7. Nonfarm Laborers include: freight handlers, construction labor, etc.

8. Service Workers include: fire and police personnel, food service workers, health service workers, cleaning service workers, household workers, barbers and hairdressers, etc.

9. Farm Workers include: farmers, farm managers, paid farm laborers, unpaid farm-family workers, etc.

RISING PRICES

A module for teaching
secondary students about
inflation and the consumer
price index with the aid of
quantitative concepts.

Project QUESST
Boulder, Colorado
September, 1979

EXPERIMENTAL EDITION

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1. Constructing An Index
2. Changing Prices
3. Relative Prices

OVERVIEW OF THE MODULE

Introduction

What is the cost of living for the average American today? How does the cost of living today differ from that of a decade ago? If the cost of living has changed, how can we measure and compare the degree of change? This module explores these questions, as well as introducing students to the economic concept of inflation. The module also introduces students to the concept of a consumer price index and the method of constructing such an index.

Change in the cost of living over time is constantly occurring. Recently, many students have heard about the economic and personal problems caused by inflation in the American economy. Students may be interested to learn that the use of a price index will allow them to measure and to compare changing prices. The Consumer Price Index can also be used by the knowledgeable consumer to locate "good" buys relative to other consumer items. Finally, knowledge about a major economic indicator will make students more literate citizens in a complex society.

Description of Materials

Courses and Topics:

Economics: Consumer Price Index, changing prices, and inflation.

Grade Level: 10-12.

Time Required: Two class periods.

Concepts and Skills:

Social Studies Concepts: Consumer Price Index, changing prices, and inflation.

Quantitative Concepts: Index numbers, percentage, and average (mea

Thinking Skills: Analyzing and interpreting.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Compare relative prices between a base year and the current year.
2. Indicate the usefulness of the Consumer Price Index, both to the economist and to the consumer.
3. Define the economic concept of inflation.
4. Construct a price index for selected consumer items.

Source of Data:

The 1977 edition of the Statistical Abstract of the United States was the source of the data presented in this module. The Abstract is published annually by the Bureau of the Census, Department of Commerce.

LESSON 1: INFLATION AND PRICES

Introducing the Lesson

1. On the chalkboard place the table with the average price of consumer goods in 1965 and 1977, as reported by the U.S. Bureau of Labor Statistics. Have small groups of students each calculate the PERCENTAGE increase in the price of an item between 1965 and 1977. Fill in the answers (the percentage change) on the table as students calculate them.

   NOTE: The percentage increases (the answers) are provided in the table below.

   To calculate the percentage increase in price, students need to know what percentage the 1977 price is of the 1965 price. So, divide the 1977 price by the 1965 price. For example, hamburger's increase is .87 ÷ .51 = 1.7058 or 170.58%. You can round this figure off to 171%. The 1977 price of hamburger is 171% of the 1965 price. Therefore the percent increase in price is 71%. Note that the 100% is the 1965 base. The 71% is the percentage increase in price.

Consumer Item	Average Price 1965	1977	% Increase 1965 to 1977
1 pound hamburger	$ .51	$ .87	71%
1 pound hotdogs	.66	1.15	74%
1 pound apples	.18	.41	128%
1 pound potatoes	.09	.17	89%
½ gallon milk	.47	.84	79%
1 dozen eggs	.53	.75	42%

2. Based on the completed table, ask students:

   --Which item show the largest price increase and which item the smallest increase? Largest--one pound of apples. Smallest--one dozen eggs.

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--What was the average (mean percentage increase in the price of the shopping basket of food from 1965 to 1977? 80.5%

> MEAN is a commonly used measure of average. Mean is an arithmetic average defined as the sum of the scores divided by the total number of scores. In this case the sum of the percentage scores is 483%. The total number of scores is 6. 483 ÷ 6 = 80.5% average increase from 1965 to 1977.

3. Ask students how they would define inflation. List ideas on the chalkboard. Define inflation for students as an increase in the general level of prices. Inflation occurs when an economy attempts to spend more than its existing level of production. When there are too many dollars competing for too few goods and services, prices rise and inflation occurs. The table above illustrates inflation between 1965 and 1977, both in absolute terms of the dollar price increase and in terms of percentage change in prices.

4. Note that inflation means that price levels change and the value of the dollar also changes. In the United States, in the past decade, there has been inflation and changing values of the purchasing power of the dollar. There has also been real economic growth in the economy and a general increase in the personal disposable income of Americans. Increased personal disposable income results when the annual average salary increases are higher than the average annual rate of inflation.

5. Indicate to students that the data they just worked with (prices, 1965-1977) presented both the current dollar price of selected consumer items for 1965 and 1977, and the percentage change in prices between the two years. However, there are literally millions of different kinds and brands of consumer items purchased each year, and the price of each item can change at its own rate. That is, inflation does not have an equal impact on all prices of all consumer items. For the average citizen, or for the economist, it is easier to understand and to plan for changing prices and varying purchasing power of the dollar when a single measure of change can be substituted for the multitude of changing prices. The common economic device used to measure and indicate such change is an INDEX NUMBER, such as the Consumer Price Index used by the U.S. Government to measure and report changes in the "cost of

Developing the Lesson

6. Explain to students that the Consumer Price Index (CPI) is compiled and reported by the Bureau of Labor Statistics in the U.S. Department of Labor. The CPI is determined by pricing a market basket of a sample of several hundred goods and services, and computing the Index based on the overall average price of the market basket. Changing prices are indicated by comparing the current year's Index to a base year. At the moment, 1967 is used as a base year, and the CPI compares the current cost of living against the cost of living in 1967.

> The market basket of goods and services is designed to reflect the buying or purchasing patterns of urban wage earners. The items selected are common items required by most people to live in an urban society. Food items include the average price of milk, bread, potatoes, and hamburger. The average cost of rent or home mortgage payments are housing items. The average cost of shoes, sweaters, and dry cleaning are apparel items. The average cost of gasoline and bus fare are transportation items. The average cost of aspirin and movie admissions are health and recreation items. An average of all items in the market basket constitutes the Consumer Price Index.

7. Continue providing information on the Consumer Price Index by emphasizing to students that:

   --Prices of different goods and services do not change by the same amount during the same period of time. In fact, the price of a single item may change by different amounts in different parts of the country during the same period of time. To overcome such problems and to make the index representative of a large number of people, a sample of a few hundred consumer goods and services are selected and price changes are averaged.

   --Averaging such items is not a simple process, it is a complex procedure which involves weighting items according to their relative usefulness.

For example, chicken is more important in the average food budget than are carrots, yet both are food items included in the market basket upon which the Consumer Price Index is based. If it is decided that chicken is five times as important as are carrots in the average urban dwellers' food budget, then carrots could be assigned a weight of one and chicken could be assigned a weight of five.

8. Distribute "Constructing an Index" (Student Materials #1) and allow students a few minutes to read it. In small groups have students answer the two questions. Answers are:

   --What is the total of weighted items for the current year? $5.25. If $.35 × 1 = $.35 and $.98 × 5 = $4.90, then the total of $4.90 + $.35 = $5.25.

   --What is the index number for the current year? 131. If $4.00 = 100 on the index in the base year then 100 ÷ 4 = 25, as each $1.00 is equal to 25 points on the index. For the current year, 25 × $5.25 = 131.25 or 131 on the index.

   --What does an index of 131 mean? An index number of 131 in the current year tells us that our price index has risen from 100 to 131. This means that prices, on the average, have risen 31 percent.

   --Tell students that economists find the cost of living indexes extremely useful in measuring the general trend of prices. However, there is a problem of accuracy with an index. Some of the major problems associated with an index are indicated by the brief reading following the table of index numbers in Student Materials #1. Have students read the last part of Student Materials #1.

9. Distribute "Changing Prices" (Student Materials #2). Based on the graph of the Consumer Price Index (1876–1977), ask students:

   --What is the overall trend in consumer prices in the U.S.? Generally rising prices. However, there have been fluctuations, periods of falling prices in the last quarter of the 19th century, following the end of World War I, and the period of the Great Depression in the latter part of the 1920's and first few years of the 1930's.

--When did the first major increase in consumer prices occur? 1915-1920, the period of World War I.

--When did the next major increase in consumer prices occur? The 1940's during the years of World War II and immediately thereafter. The rate of increase was less during the 1950's and early 1960's. The rate of increase rose during the years of the Vietnam War and has continued to increase at a relatively high rate throughout the 1970's.

10. Distribute "Relative Prices" (Student Materials #3). Ask students:

--What is the dominant price trend indicated by the table? Rising prices between 1960 and 1977. The Consumer Price Index rose from 88.7 in 1960 to 180.6 in 1977 (The CPI = 100 in the base year of 1967). Four out of five consumer items' prices also rose between 1960 and 1977. The four items were new cars, doctor fees, restaurant meals, and homeownership.

NOTE: As indicated by constructing an index in Student Materials #1, the index number of an item for each year is relative only to the price of that item in the base year. In Student Materials #3, we can compare the relative rate of change between index numbers of the five items. Obviously, however, the index of 127.6 for new cars' prices in 1975 does not mean that a car cost less than a restaurant meal, with an index number of 173.2 in 1975.

--What is the only consumer item in the table which declined in price between 1960 and 1977? Television sets, which decreased from 127.1 to 101.6.

--Which item in the table had the largest price increase from 1960 to 1977? Doctor's fees, which increased from 77.0 to 204.3.

--Based on students' knowledge of rising prices, what other consumer items' prices have risen steeply in the past decade? Homeownership costs, all forms of medical goods and services, gasoline, fuel oil and electricity, bus fares, and the price of fish are among the items listed in the Statistical Abstract as having the largest price rises between 1960 and 1977.

--Based on students' knowledge of prices, what other consumer items' prices have fallen over the past decade? Computers, in all sizes, have declined in price rather dramatically.

Concluding the Lesson

11. Again, looking at the table in Student Materials #3, ask students which items today have increased less than the increase in the Consumer Price Index. Points to be emphasized are:

--The average price of television sets actually declined between 1960 and 1977.

--The average price of new cars has risen since 1960, but rose less than the CPI.

--The average price of homeownership, doctors' fees, and eating out in restaurants all rose at a rate higher than the CPI.

12. Inform students that for most consumer items the absolute price level rose over the last decade. That is, most items cost more in terms of dollars and cents today than they did a decade ago. The lower price of televisions, computers, and certain other consumer items are the exception to the general trend of rising prices. However, the relative price of certain goods is lower now than a decade ago. For example, in 1960, new cars were relatively more expensive than doctors' fees, homeownership costs, and the costs of meals in a restaurant. In 1977, new cars were relatively cheaper than these other consumer items. With inflation and rising incomes, the absolute price of a consumer item is not as important as the relative price of the item to many wise consumers.

To illustrate, suppose that the average of all prices (the CPI) has risen 100%. During the same period, the average price of shoes rose 70%, the average price of furniture rose 60%, and the average price of drugs and prescriptions rose 40%. Although the absolute price of shoes, furniture, and drugs has risen, the increase was less than prices in general. Shoes, furniture, and drugs are "good" buys relative to those items (e.g., gasoline and doctors' fees) which rose at a higher than average rate.

13. In small groups, have students compile a list of 25 items that they would include in a CPI if they were establishing the index. Make sure that students have a reason for each item included in their index. Allow groups to share their lists and discuss them in class.

14. As a class, establish a list of 25 items to be included in a CPI. You may wish to group items by categories, including food, living quarters, transportation, health, recreation, and clothing.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. Inflation is an increase in the general level of prices. Inflation occurs when an economy attempts to spend more than its existing level of production. In the U.S., rising prices have also been accompanied by rising incomes in recent times.

2. The Consumer Price Index (CPI) is compiled by the Bureau of Labor Statistics in the U.S. Department of Labor. The CPI is an index number based on the average price of a sample of several hundred consumer items. The CPI is used to measure and to report changing prices between different points in time.

3. Constructing the CPI involves taking an average of prices, which involves weighting. Weighting is a process by which consumer items are rated according to their relative importance in the average consumer's budget.

4. The base year for the present CPI is 1967. The price of all sample items equals 100 in 1967. When we compare today's prices, we compare them against the price of items in 1967 as measured by the Consumer Price Index.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Have students use the current Statistical Abstract of the United States to investigate changing prices of other goods and services. The Consumer Price Index table will be located in the chapter on Prices.
2. Have students conduct a survey of selected consumer items in different stores in the community. Compared to a year ago, which items have risen in price and which have declined?
3. Have students locate the CPI and compare items in the CPI with the items the class included in their index.

CONSTRUCTING AN INDEX

The Consumer Price Index (CPI) is constructed and reported by the U.S. Department of Labor. The CPI is constructed by figuring the average price of a large number of consumer goods and services. A single index number (the CPI) is used to simplify the process of figuring the average cost of living of people in urban areas of the nation each year.

Figuring average prices involves weighting. Weighting can be defined as assigning a relative value to a consumer product according to its usefulness to the consumer. For example, chicken is a more important item in the average consumers' food budget than are carrots. Therefore we could give carrots a weight (a measure of relative importance or usefulness) of one, and chicken a weight of five.

We can construct an index using two consumer products, carrots and chicken. The process is the same that the government follows, with hundreds of items, in constructing the Consumer Price Index. In our index we will assume that chicken is five times as important as carrots in the budget of the average American.

According to our base year (1967) data, carrots have a price of $.25 per pound and a weight of one. Multiplying the price times the weight ($.25 × 1), we get $.25. If the price of meat in the base year is multiplied by its weight of five, we get $3.75. The total of the two weighted items in the base year is $4.00 ($.25 + $3.75 = $4.00). Because we have selected 1967 as the base year, we let $4.00 equal 100 on our index. The index number for the base year is 100. We can measure other price changes against 1967 using the index.

According to our current year data, carrots have a price of $.35 per pound and a weight of one, and chicken has a price of $.98 per pound and a weight of five. What is the total of the weighted items for the current year? What is the index for the current year? What does the number index tell us?

INDEX NUMBERS

	Carrots		Chicken			
	Price per Pound	Weight	Price per Pound	Weight	Total of Weighted Items	Index
Base Year (1967)	$0.25	1	$0.75	5	$4.00	100
Current Year	$0.35	1	$0.98	5	$?	?

STOP

Do not read further yet.

Economists find cost of living indexes to be very useful in measuring prices, and changes in the prices of items between different years. However, there are some problems with indexes. These problems include:

1. What year should be used as the base year of the index for making comparisons? Economists don't know how to select the "most appropriate" year, if such a year exists. We do know that the longer the time between the base year and the current year, the less reliable will be the index. For the Consumer Price Index, 1967 is the base year now being used. To keep the index reliable, the base year will have to be moved to a more recent year at some time in the near future.

2. From what samples should the index be constructed? One reason to use an index is because it is based on a few hundred sample items and not on the thousands of items sold. There is a debate about which items to include in the sample. For example, which one food item should be selected from among corn, peas, string beans, pinto beans, and beets. Which one item would be representative of an item in the average food budget?

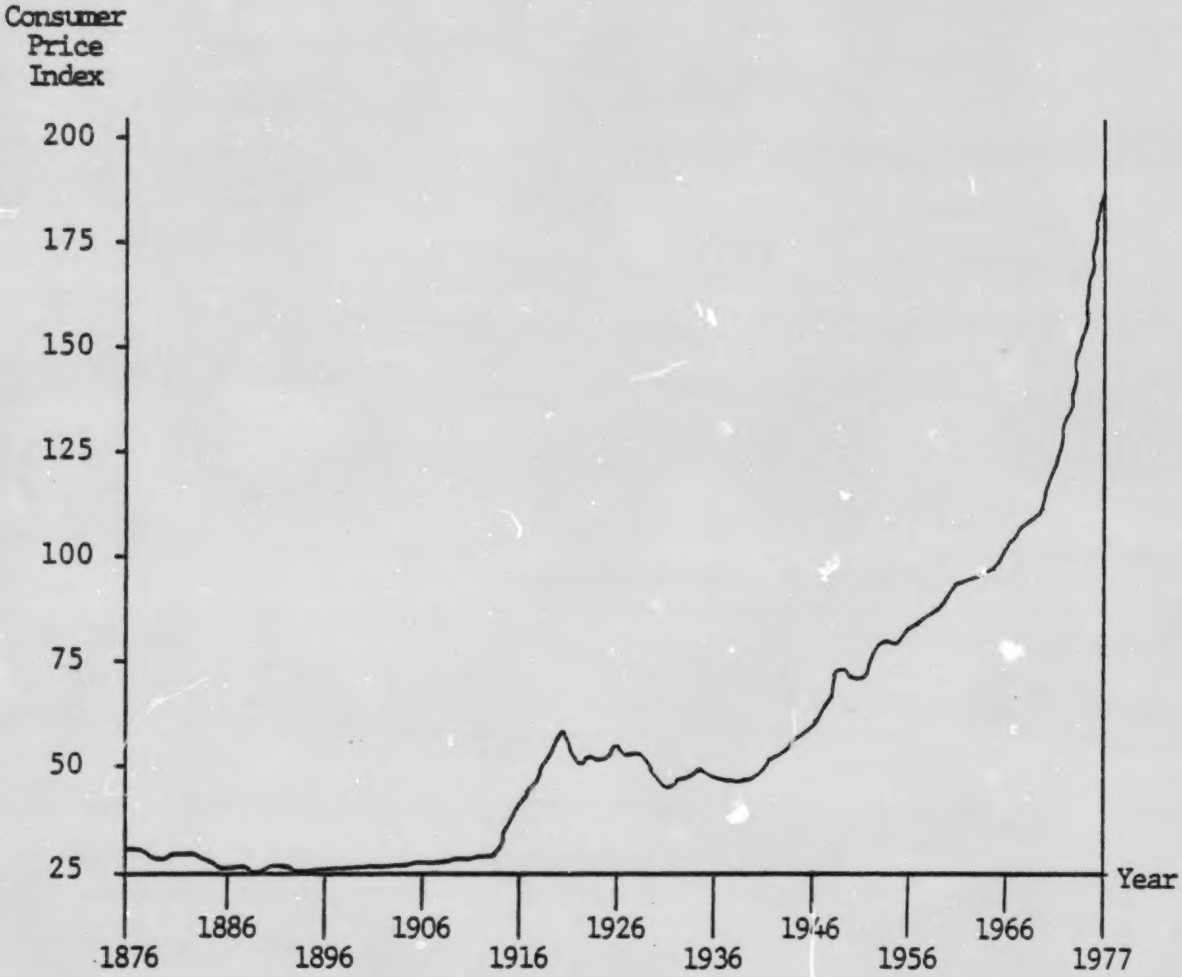
3. What weights should be assigned to each item? What weights to assign is partially a matter of opinion. Most Americans would agree that chicken is more important than are carrots in the average food budget, but how much more important--three times, four times, five times?

4. Finally, the sample cannot always be the same from base year to base year. Some consumer items are new inventions, other consumer items disappear from the marketplace. For example, television was not available in the 1930's to the consumer. Today, television sets are an important item in the Consumer Price Index sample.

Even with these problems, economists and government planners find indexes to be very useful in measuring and reporting changes in the prices of consumer goods and services.

CHANGING PRICES

Consumer Price Index
(1878–1977)



The changing prices of consumer items in the U.S. from 1876 of 1977. The Consumer Price Index equals 100 in 1967.

Source: Based on data in the Statistical Abstract of the United States and various publications of the Department of Commerce and the Department of Labor.

RELATIVE PRICES

Consumer Price Index: 1960–1977

(Selected Index Items)

Year*	New Cars	TV Sets	Doctor Fees	Restaurant Meals	Home-ownership**	CPI***
1960	[illegible]04.5	127.1	77.0	81.2	86.3	88.7
1965	100.9	107.3	88.3	90.7	92.7	94.5
1970	107.6	99.8	121.4	119.7	128.5	116.3
1975	127.6	101.6	169.4	173.2	181.7	161.2
1977	141.4	101.6	204.3	197.0	202.3	180.6

Source: Statistical Abstract of the United States, 1977, pp. 478–479.

*1967 is the base year for the Consumer Price Index. All items = 100 in 1967.

**Homeownership includes home purchase, mortgage interest, taxes, insurance, and repairs.

***The total index number for the Consumer Price Index.

[illegible]

ECONOMICS: INCOME AND PRICES

A module for teaching high school students
about the relationship between income and prices
with the aid of quantitative concepts.

Project QUESST
October, 1979
Boulder, Colorado

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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3. Per Capita Income (in current dollars), 1950-1976.
4. Consumer Price Index and Per Capita Disposable Income, 1950-1975.
5. Average Income and Percent Change in Real Income by Selected Occupations, Race, and Sex, 1966 and 1976.
6. Case Studies - Who Gets Hurt? Who Doesn't?

OVERVIEW OF THE MODULE

Introduction

Since the late 1960's the incomes of various groups (e.g., occupational, race, and sex) have been rapidly moving upward. The problem is that prices, too, have been rapidly moving upward.

Through the use of a collage of newspaper headlines, graphs, tables, and case studies, this module will examine a number of questions related to the upward movement of wages and prices in recent years. Why is per capita disposable income a more accurate measure of people's spending power than per capita income? How much have wages increased compared to prices since the 1950's? How does inflation reduce the actual purchasing power of the dollar? Who gets hurt the most by inflation? Who the least?

Description of Materials

Courses and Topics:

Economics: Wages, prices, income distribution, and occupations.

American History: Post-WWII economic trends.

Grade Level: 10-12.

Time Required: One-two class periods.

Concepts and Skills:

Social Studies Concepts: Income (per capita, personal disposable, and real) consumer price index, inflation, and occupational groups.

Quantitative Concepts: Percent, tables, and line graphs.

Thinking Skills: Comparing and interpreting.

Instructional Objectives:

At the conclusion of this module, students will be better able to :

1. Explain per capita personal disposable income and why it is a better measure to use than per capita income when compared to the Consumer Price Index.
2. Compare the rates of change in disposable income and the Comsumer Price Index for 1950-77.
3. Identify which groups (occupational, race, and sex) have kept up with inflation rates in recent years.
4. Discuss the different effects of inflation on various groups.

Sources of Data

The 1970 and 1977 editions of the Statistical Abstract of the United States were the sources of data for the comparison of income in 1966 and 1976 by selected occupations, race, and sex. The Abstract also provided data on the Consumer Price Index and per capita disposable income from 1950 to 1977, and was one of the sources for the graph on per capita income from 1950 to 1976. It is published annually by the Department of Commerce, Bureau of the Census. The other major source for the module was Historical Statistics of the United States; Colonial Times to 1970, part I, the third in a series of volumes inaugurated in 1949 by the Bureau of the Census with the cooperation of the Social Science Research Council. Like the Abstract the third volume of Historical Statistics should be available in the government documents section of most libraries.

LESSON 1: STAYING EVEN?

Introducing the Lesson

1. As an opening activity, use "Collage of Newspaper Headlines-Wages and Prices" (Student Materials #1). The collage includes newspaper headlines of wage price increases over a recent time period. It can serve as an introduction to the wage-price spiral in our economy. Students should notice immediately that as wages go up, so do prices, and vice versa. Conduct a follow-up discussion of the headlines focusing on the question of whether income is rising faster than prices. The following questions will help guide the discussion:

   --Which headline reports the greatest increase? Hershey Foods Corp. Raises Price of Candy Bars by 25%.

   --Which reports the smallest increase? Cleveland Teachers Receive Immediate 8% Pay Raise.

   --In general, does it appear that prices or incomes have been increasing more rapidly? Why? If students list the various increases reported in the headlines on a table like the one below, they will conclude that prices have generally risen more rapidly than income.

Incomes	Prices
Auto Workers - 9%	Rail-Rates - 8.3%
Income - 9.6%	New Cars - 10%
Postal Union (3 yr.) - 19.5%	Food Costs - 11.5%
Cleveland Teachers - 8%	Housing Costs - 10%
	Candy Bars - 25%

Developing the Lesson

2. Before dealing with the graphs included in this module, make sure that students understand the meaning of the following economic terms:

   --Consumer Price Index - According to the U.S. Department of Labor, Bureau of Labor Statistics, "the Consumer Price Index (CPI) is a statistical measure of change, over time, in the prices of goods and services in major expenditure groups--such as food, housing, apparel, transportation, and health and recreation--typically purchased by urban consumers. Essentially it measures the purchasing power of consumers' dollars by comparing what a sample market basket of goods and services costs today with what the same sample market basket cost at an earlier data."

--Per capita income - total income divided by the total population.

--Per capita disposable income - the personal income left over after income taxes (federal, state, and local). It is considered by economists to be a more accurate measure than per capita income since as wages try to keep up with prices, people move into higher income tax brackets. Thus, their tax increases becomes progressively worse and they have proportionately less disposable income.

--Real income - generally defined as actual income divided by the price level or a price index. We may also add as a factor in real income the psychological returns that individuals receive from things they do.

3. Show the graph "Consumer Price Index (CPI), 1876-1977" (Student Materials #2). Emphasize that, as the graph indicates, prices have not always been rising even though there has been a steady upward trend since the end of World War II. Ask students what the effects would be if the index continued its upward trend of the past ten years.

4. Point out that if everything went up in price except income, people would be in trouble. Show the graph "Per Capita Income (in current dollars), 1950-1976" (Student Materials #3) and ask students to compare it with the previous graph of the CPI. Use the following questions to assist students in making their comparison."

--What has been the trend in per capita income since 1950? It has been steadily increasing.

--How does this trend compare with the CPI since 1950? The trends are very similar.

--During which five year time period did the greatest increase in per capita income take place? During the past five years.

--Greatest increase in CPI? Same.

--Historically speaking, have most people's incomes kept up with inflation? Yes, although the graphs only allow us to approximate the two factors.

5. The students have now been exposed to the CPI and per capita income as economic measures. The activities up to this point in the module have asked students only to speculate about the relationship between the two in terms of which is rising faster. Introduce per capita disposable income as a more accurate measure than per capita income and explain that it too can be compared to the CPI to determine if income has kept up with inflation. Present "Consumer Price Index and Per Capita Disposable Income, 1950-75" (Student Materials #4), and ask the students to calculate the percent changes in both the CPI and per capita disposable income since 1950.

   To compute percent change students may use the following steps:

   First: Subtract the first number (base year value) from the second number (comparison year value) to find the absolute change.

   Example: 1950 Per Capita Disposable Income = 1, 364.
   1955 Per Capita Disposable Income = 1, 666.

   Absolute Change = 1, 666 - 1, 364 = 302.

   Second: Divide the absolute change by the base year value to yield the percent change.

   Example: 302 ÷ 1,364 = .221, or 22.1%.

Time Period	Per Capita Disposable Income		Consumer Price Index	
		Percent Change		Percent Change
1950-55	(1,364 - 1,666)	22.1%	(72.1 - 80.2)	11.2%
1955-60	(1,666 - 1,937)	16.3%	(80.2 - 88.7)	10.6%
1960-65	(1,937 - 2,436)	25.8%	(88.7 - 94.5)	6.5%
1965-70	(2,436 - 3,376)	38.6%	(94.5 - 116.3)	23.1%
1970-75	(3,376 - 5,108)	51.3%	(116.3 - 161.2)	38.6%
Total Percent Change		154.0%		90.0%

6. Follow-up the calculations by asking students:

   --During which period did the greatest increase in per capita disposable income take place? 1970-75. Smallest increase? 1955-60.

   --During which period did the greatest increase in the CPI take place? 1970-75. Smallest increase? 1960-65.

   --Which is rising faster, personal income or prices? Personal income.

   --Does this confirm your original speculation as to whether income has kept up with prices?

7. As the data indicate, if income is keeping up and even surpassing prices, not everyone is worse off in spite of the inflation.

   --Which groups in particular would suffer least from the rise in prices? Those who could keep up their income through collective bargaining, the self-employed, and those with skills highly in demand by society.

   --Which groups would suffer most? People on fixed income, senior citizens, unemployed, the disabled and handicapped, etc.

8. Explore the answers to these questions in depth by having students interpret the data in "Average Income and Percent Change in Real Income by Selected Occupations, Race, and Sex, 1966 and 1976" (Student Materials #5). A more detailed explanation of real income (and how it differs from nominal income) is provided by the following note:

   Nominal and Real Income: "Inflation has made everyone aware that an increase in dollar earnings does not necessarily make it possible to buy more goods and services. The value of increased earnings depends on what has happened to prices. It is common to adjust, or "deflate," dollar income to account for price changes. Unadjusted dollar income is called nominal income; adjusted dollar income is called real income. Adjusted, or real, income is referred to some base year. The current base for the Consumer Price Index is 1967 (it will be changed to a later date before long). The price index for 1978 was almost 200.

If your dollar income in 1967 was $10,000 and your dollar (nominal) income in 1978 was $20,000, your real income in 1978 was about $10,000 (the same as in the base year, 1967). The arithmetic of deflation is not always that simple, of course. Suppose, for example, that you have the following information.

Year	Nominal or dollar income	CPI (1967 = 100)
1970	$ 9,973	116.3
1977	16,318	181.5

Since $16,318 ÷ $9,973 = 1.636, nominal increase is 63.6 percent. What is the real increase?

$9,973 ÷ 116.3 x 100 = $8,575 adjusts 1970 earnings to the 1967 base.

$16,318 ÷ 181.5 x 100 = $8,991 adjusts 1977 earnings to the 1967 base.

Since $8,991 ÷ $8,575 = 1.049, the real increase in income is 4.9 percent".

The table not only compares average income by selected occupations, race, and sex, but also shows how much of an increase in income actually occurs when inflation and the declining value of the dollar are taken into account. Ask:

--How does the income of males compare with females over the time period? The percentage increase in the average income of females has been faster, but in absolute figures it is still well below that of males.

--How do whites compare with blacks? The percentage increase in the average income of blacks has been nearly as fast, but again in absolute figures it is still well below that of whites.

--How do white collar workers compare with blue collar? White collar workers, especially self-employed (doctors, dentists, lawyers) have significantly outpaced the salary gains of blue collar workers.

Concluding the Lesson

9. Have students read "Who Gets Hurt? Who Doesn't?" (Student Materials #6) and ask them to compare the degree of hardship that rising prices force on the people in each of the cases. Class discussion might center around such questions as:

--Who gets hurt most by inflation? Those people on fixed incomes, creditors, and people whose assets are tied to dollar values--e.g. bonds and savings accounts. Who least? Those people who have some control over their wages and salaries, debtors, and people whose investments are in real property.

--Does anyone gain from inflation? If so, who and why? Yes, those who have a good deal of control over their wages or salaries and the prices of things (both goods and services) they sell can gain by inflation. Doctors, for example, have improved their financial position since the 1950s.

--Is inflation always a "bad" thing? Students should now be able to point out that inflation must be considered in a wider context and that it effects different people differently. For some it is bad while for others it is beneficial.

--What specific changes in lifestyle are brought about by rising prices?

Make sure that the students bring in specific examples from the case studies in support of their arguments.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. When comparing trends in consumer prices with those of personal income, per capita disposable income is considered a more accurate measure of an individual's spending power than per capita income because per capita disposable income is the income left over after income taxes (federal, state, and local).
2. Inflation has risen steadily since the end of World War II to the present, but personal income has kept up and even surpassed the rise in consumer prices during the same period.
3. The decline in the purchasing power of the dollar means that everyone, to a certain extent, suffers from the effects of inflation. There are some groups, however, that suffer more than others. These include people living on fixed incomes, senior citizens, unemployed, and the disabled and handicapped among others.
4. A comparison of average income trends from 1966 to 1976 indicates that Blacks and females have made noticeable gains in income during the period but each group is still well below the average income for a white male. Also during this period, the salary gains of white collar workers, especially those who are self employed, have been significantly greater than those of other occupational categories.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Have students bring in old newspapers and magazines to class and check the advertising section to follow the price of a certain item over a specified period. Which items seem to have gone up the most? Which least? Ask students to hypothesize why some items have increased in price faster than others.

2. With parental assistance, students could obtain a monthly record of family expenditures. Assuming that inflation continues at its current pace, ask students to decide where cutbacks in expenditures might have to be made in the future. What steps could be taken by the family in the meantime as protective measures against inflation?

3. Invite a representative of a local supermarket or business enterprise to speak about changes that have affected prices in recent years. The speaker should address, among others,the questions of supply and demand, the influence of science and technology, patterns of consumption in the U.S., and labor's push for higher wages.

4. Specific approaches and strategies for teaching and learning about the problems of those living on fixed incomes in our society can be found in a paper by Francis E. Pratt, Teaching About Aging, available from the Social Science Education Consortium, 855 Broadway, Boulder, Colorado, 80302.

ECONOMICS: INCOME AND PRICES

SUPPLEMENTARY TEACHER
MATERIALS #1
(Information Sheet)

THE COSTS OF LIVING

Item		1978 Cost	*1983 Cost	Percent Change
1.	Shopping Cart of Food	$50	$77	+54%
2.	New House	$55,000	$89,600	+63%
3.	New Car	$5,000	$6,875	+38%
4.	Clothes Washer	$200	$268	+34%
5.	Electric Bill	$100	$158	+58%
6.	Man's Topcoat	$125	$149	+19%
7.	One Day in a Hospital	$100	$179	+79%
8.	Woman's Dress	$60	$72	+18%
9.	One Year in College (tuition, room and board in private college)	$5,200	$7,740	+49%
10.	Tank of Gasoline	$13.28	$24.16	+82%

*Assumes average annual inflation rate of 6 percent.

Source: The data has been compiled from various publications put out by the U.S. Dept of Commerce.

COLLAGE OF NEWSPAPER HEADLINES – WAGES AND PRICES

Auto Workers to Receive 9% Hike in '79

8.3% Rail-Rate Hike Studied by Kahn

Cost of Owning New Car Jumps 10%

Food Costs for January Rise at 11.5% Annual Rate

Housing Costs to Jump 10% in '79

9.6% INCREASE IN INCOME NOTED DURING 1978

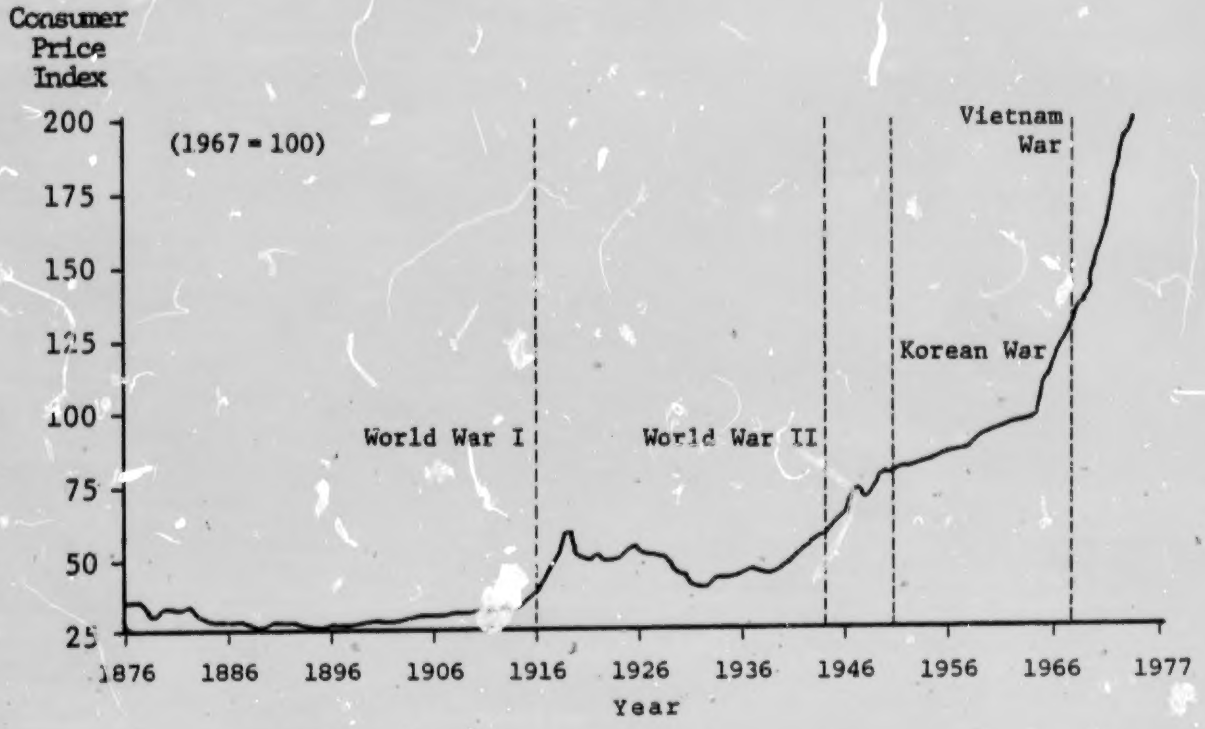
Postal Unions Agree on Three-Year 19.5% Wage Increase

Hershey Foods Corp Raises Price of Candy Bars by 25%

CLEVELAND TEACHERS RECEIVE IMMEDIATE 8% PAY RAISE

UNIONS DECIDE TO IGNORE CARTER'S WAGE PRICE GUIDELINES

CONSUMER PRICE INDEX (CPI), 1876-1977

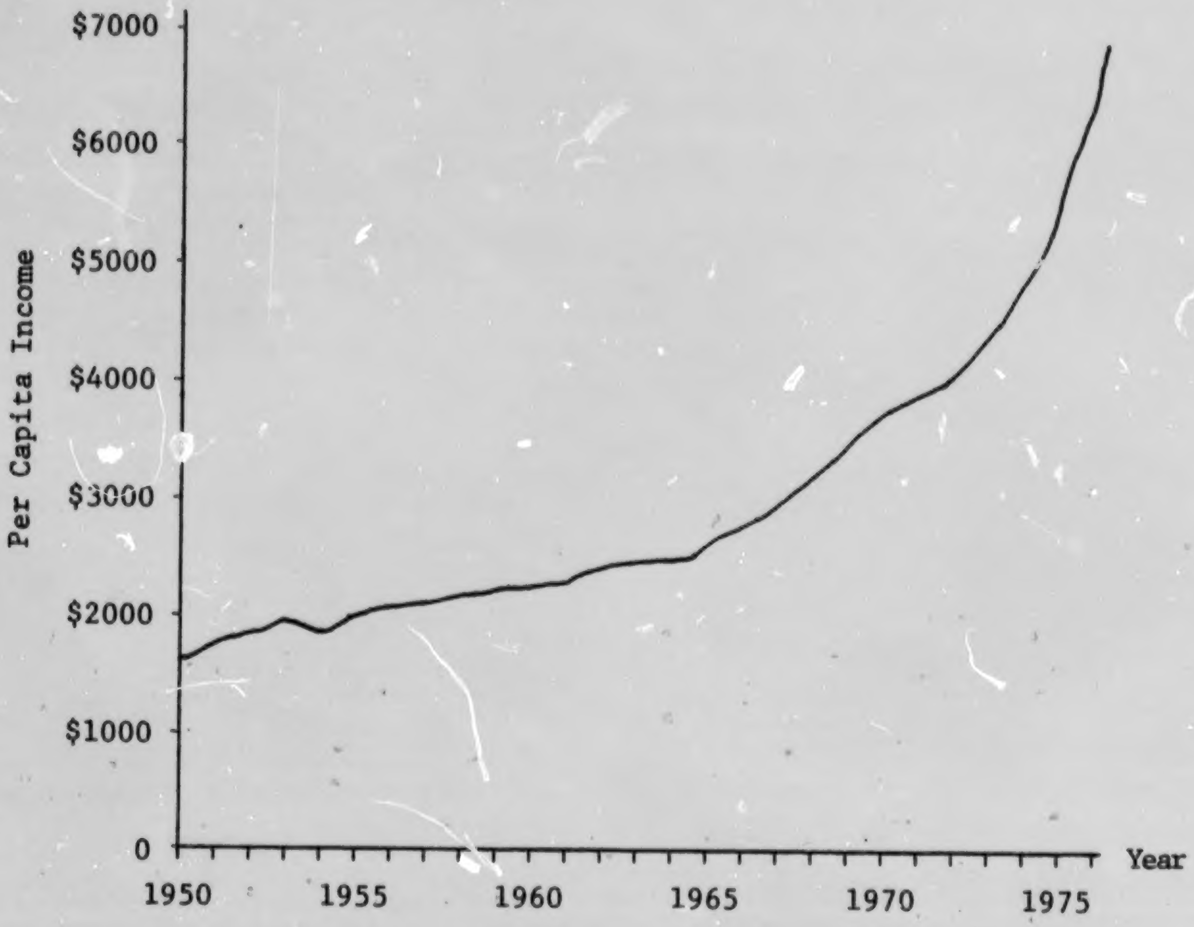


Note: A rise in the wholesale price index has been associated with almost every war in American history.

Sources: 1. Historical Statistics of the United States, Colonial Times to 1970, part I.

2. Statistical Abstract of the United States, 1977.

PER CAPITA INCOME (IN CURRENT DOLLARS), 1950-1976



Sources: 1. Historical Statistics of the United States, Colonial Times to 1970, part I.
2. Statistical Abstract of the United States, 1977.

CONSUMER PRICE INDEX AND
PER CAPITA DISPOSABLE INCOME, 1950-1975

Per Capita Disposable Personal Income

Year	Amount (In current dollars)	Percent Change
1950	$1,364	________%
1955	$1,666	________%
1960	$1,937	________%
1965	$2,436	________%
1970	$3,376	________%
1975	$5,108	________%
	Total Percent Change	________%

Consumer Price Index

Year	Index Number	Percent Change
1950	72.1	________%
1955	80.2	________%
1960	88.7	________%
1965	94.5	________%
1970	116.3	________%
1975	161.2	________%
	Total Percent Change	________%

Sources:
1. Historical Statistics of the United States, Colonial Times to 1970, part I.
2. Statistical Abstract of the United States, 1977.

AVERAGE INCOME AND PERCENT CHANGE IN REAL INCOME BY SELECTED OCCUPATIONS, RACE, AND SEX, 1966 and 1976

	1966 Average Income	1976 Average Income	Equivalent in 1966 Dollars	Percentage Increase in Real Income
SEX:				
Male	$6,300	$12,428	$7,085	12.4
Female	$3,810	$7,644	$4,357	14.3
RACE:				
White	$7,222	$14,630	$8,340	15.2
Black	$4,190	$8,424	$4,802	14.6
SELECTED OCCUPATIONS:				
White Collar (Self employed)	$13,723	$31,654	$18,045	31.4
All White Collar	$8,450	$17,537	$9,997	18.3
Blue-Collar Craft-Workers	$6,892	$13,638	$7,773	12.8
Clerical Workers	$6,100	$11,843	$6,751	10.6
Service Workers	$4,361	$8,674	$4,945	13.3

Consumer Price Index

1966 = 97.2
1976 = 170.5

Average Annual Rate of Inflation, 1966-1976 = 5.7%

Source: Statistical Abstract of the United States, 1970 and 1977 editions.

CASE STUDIES - WHO GETS HURT? WHO DOESN'T?

1. The Case of Frank Jacobs

Philadelphia - Frank Jacobs, 72, is a widower and lives alone in Southwest Philadelphia. He has been retired for the past seven years. After his wife died 9 years ago, he sold their home of 35 years and moved to a three-room efficiency apartment located on the second floor of a two-family house. His apartment is small, but warm and comfortable. He has modern furniture including a small color television set and an AM/FM radio. His rent, including heat, water, and electricity is $250 per month. He receives a social security check of $275 per month and this is supplemented with a state pension of $150 per month. Out of this total he pays rent and uses the remainder for food, clothing, medical expenses, and extras, such as newspapers and the movies. Frank's savings account amounts to $16,500, mostly the profit leftover from the sale of his house.

2. The Case of John and Betty Swett

Chicago - John Swett, 35, and his wife Betty, 31, live in a modest home in a suburb of Chicago for which they paid $51,000 in 1977. John is a high school teacher and his wife is a legal secretary. Together they have a combined income of $32,000. They have a 6 month old daughter who is cared for by Betty's mother. She just turned 67, however, and cannot be expected to continue caring for the child on a daily basis. The Swetts eat out once a week; they own a nine-year old television set and a '71 Olds. They make mortgage payments on their house of $350 a month. They have paid for most of the furniture in the house but have managed to save only $1,200 since they were married six years ago. "We would like to have another child," says John, "but we're afraid that if Betty has to leave her job, my income will not be enough to cover our living expenses, especially the mortagage payments on our new house."

3. The Case of Ira and Marsha Parker

Los Angeles - Ira and Marsha Parker, both 45, live in a 4 bedroom ranch house in an affluent suburb east of Los Angeles. Ira is a corporation executive and earns $65,000 per year. Yet he is worried about making ends meet in 1979. As Ira views the coming year, taxes will take about 30% of his income, educational bills for two children away at college will run $12,000, mortgage payments on his home will run $500 a month, and his wife's allowance of $1,900 a month is used to pay for food and household expenses, plus a cleaning women's wages, clothing, and other department store purchases. Ira has two cars, one used exclusively for business. Both are kept in good condition and are replaced every five or six years. Neither will be replaced in 79. They are still paying off debts from the early years of their marriage, and they are also supporting Ira's parents who are retired. They do not think they live ostentatiously and often wonder where the money goes. They have little savings and last year borrowed to pay their taxes.

4. The Case of Diane and Michael Fernandez

Boston - Michael Fernandez is a seasonally employed construction carpenter in Boston, Mass. His annual income has risen $6,000 in the past four years and he now makes $17,000 per year. Diane and Michael have two small children, ages 2 and 4. They live in one of Boston's older neighborhoods in a 3 bedroom house which they were able to purchase 3 years ago for $22,000, mainly because the house was in such poor condition when they bought it. Michael and a few of his friends have spent countless hours since then fixing up the house and making it more liveable. The low purchase price of the house means that the couple pays a monthly mortgage of only $150. Even so, they are still paying about $265 a month on their two cars - a 1975 Chevrolet Sedan and a 1976 Dodge Van. And payments on the furniture they bought before their wedding amounts to another $100 monthly. There's also the possibility that they will have to buy a new car or van because their main source of transportation, the van, was wrecked in an accident during one of the season's first snowstorms. At 25, Michael is aware of the ups and downs of a construction worker's life. He was laid off during the last recession just a month before his wedding. Now, five years later he is "just getting back on top of things."

Cluster ✓

THE ENERGY CRUNCH AND THE NUMBERS GAME

A module for teaching high school
students about population growth and energy
consumption with the aid of quantitative concepts.

Project QUESST
Boulder, Colorado
October, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Student Materials

1. Energy Pretest.
2. Calendar for Your Income.
3. The Bottle.
4. World Population - 1 AD - 2000 AD.
5. Comparative International Statistics.
6. Total U.S. Energy Consumption and Population: 1920-1975.
7. Population/Energy Resources, 1900-2100.

OVERVIEW OF THE MODULE

Introduction

Energy legislation, rising energy prices, and energy shortages all focus attention upon the issue of energy consumption. Environmentalists, politicians, energy consumers, and energy producers propose a wide variety of solutions to America's energy needs. This module explores the role of exponential population growth as a contributing factor to our rising energy demands. Students are introduced to quantitative concepts of correlation and rates of change (exponential growth).

Description of Materials

Courses and Topics:

Consumer Issues: Rising energy costs.

Current Social Problems: Energy scarcity.

Environmental Issues: Energy consumption.

Grade Level: 7-12.

Time Required: Two class periods.

Concepts and Skills:

Social Studies Concepts: Population growth and limits to growth.

Quantitative Concepts: Correlation and rates of change (exponential growth).

Thinking Skills: Inferring and interpreting.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Explain that exponential growth of population and use of energy may create conditions which are not obvious until later stages of an exponential progression.
2. Use graphs and tables to make inferences, interpretations, and predictions about the relationship between population growth and energy consumption.
3. Recognize an exponential progression, and recognize that later stages of exponential progressions involve large absolute changes.

Sources of Data:

The 1975 edition of the Statistical Yearbook of the United Nations was the source of data for world population growth. This reference is published yearly by the United Nations. The example of the exponential growth of bacterium was adapted from Albert Bartlett, "The Forgotten Fundamentals of the Energy Crisis, "University of Colorado, unpublished paper. The 1977 edition of the Statistical Abstract of the United States was the source of data for energy consumption and population growth. The Abstract is published annually by the Department of Commerce, Bureau of Census. The graph of Population and Energy Resource 1900-2100 eas taken from Technology Review, 73, 3 (Jan. 1971).

LESSON 1: EXPONENTIAL GROWTH

Introducing the Lesson

1. Have students complete the motivational pre-test (Student Materials #1) and discuss the answers. Answers are provided in an answer sheet--Supplementary Teacher Materials #1.

   NOTE: Indicate to students that the staggering sums which are the answers to questions #3, 4, and 5 are a result of exponential progressions.

   Explain that two frequently encountered types of growth are exponential and linear. Exponential growth occurs when quantity increases by a constant percentage of the whole in a constant time period. For example, lillies in a pond grow exponentially with a 100% increase per day. On day one, there is 1 lilly in the pond; on day two, 2 lillies; day three, 4 lillies; day four, 8 lillies; and day five, 16 lillies. Notice that each day, the base number for doubling includes all previous growth. Linear growth, on the other hand, adds a constant number during a constant time period. For example, you may want to buy lilly plants and can afford to buy one each day. Ignoring natural growth rates, your lilly collections would grow according to the following pattern. On day one you buy 1 lilly; day two you buy another for a total of 2 lilles; day three you have 3; day four you have 4; day five you have 5. A comparison of linear and exponential growth may be illustrated in table form as shown below:

Day	Exponential Growth	Linear Growth
	Total Number of Lillies	Total Number of Lillies
1	1	1
2	2	2
3	4	3
4	8	4
5	16	5
	Constant percentage = 100%	Constant Number = 1

Developing the Lesson

2. Tell students that you have a plan which can make them very wealthy within a month. All they have to do is convince their employer to accept the following revision in their pay. On the first day of the month, their employer only has to pay them a penny. On the second day the employer must pay two pennies. On the third day the employer must pay four pennies. Everyday the employer must pay double what he/she paid the day before, until the end of the month. Ask students to estimate how much money their employer will have to pay them on the final day of the month. Record on the chalkboard several estimates representing a wide range.

3. Distribute the daily calendar for your job income (Student Materials #2) which indicates the income for each day. Ask students what their income would be after 7 days, 14 days, 21 days 30 days. Ask students to compare the income on each of these days.

   --What seems to happen to the size of their income during the last two weeks? It is progressively larger than it was during the first two weeks. It is an example of exponential growth.

4. Ask students to construct a bar graph of their income. Along the horizontal axis they will write the label "day and number 1 through 30. They will label the vertical axis "Income" and use any constant interval scale which they think is appropriate. Students soon will recognize that it is difficult to construct a meaningful scale which measures income because of the extreme range involved. As students become frustrated by their inability to construct a scale which can measure the wide range of their allowance, ask them:

   --Why is it so difficult to select an appropriate scale? The amount is so small at the beginning and grows so rapidly towards the end that it is difficult to construct an appropriate scale using constant intervals. However, graphs over wide ranges can be made on logarithmic paper. Logarithmic graph paper uses a scale which does not have a constant interval between units on the graph. Instead, the intervals vary, which allows construction of graphs over extreme ranges.

--What does the inability to use graphs with a constant interval scale indicate about exponential growth? It occurs across extreme ranges. This step should illustrate for students the extreme range involved in exponential growth rates.

5. Pursue the idea of exponential growth by asking students:

--Why might your employer accept such an allowance scheme at first sight if he/she were not aware of exponential growth? Exponential growth is extremely deceiving. If students are observant, they will notice how slowly their income grew during the first week, and how it suddenly started to grow very rapidly. For example, at the end of the first week, they only received 64¢, but in another 21 doublings they were receiving over a million dollars.

--What seems to be some important characteristics of exponential growth? Slow initial absolute change, rapid absolute change later in the progression, description by extreme numbers.

Concluding the Lesson

6. Indicate to students that exponential progressions can be used to describe many different situations. In addition to describing the income plan, it also describes increasing demands for resources, highway construction rates, and the growth rate of bacteria. That is, one bacterium divides and becomes two. The two become four, which become eight, and the eight become sixteen. The length of time required to double the number of an item is called the doubling time. For certain types of bacteria one minute is required for the number of bacteria to double; that is, the doubling time is one minute. Given a doubling time of one minute, assume that we could put one bacterium in a bottle at 11:00 a.m. and observe that that the bottle is full at 12:00 noon. This is an example of exponential growth in a finite environment; that is, there are limits to the environment.

Distribute copies of "The Bottle" (Student Materials #3) describing the growth of the bacteria and pose the following questions:

--When was the bottle half full? 11:59 a.m.

--If you were a bacterium in the bottle, when would you realize that you were running out of space? This question is difficult to answer precisely, but even an extremely intelligent bacterium probably would not recognize the problem as late as 11:55 although there was only five minutes remaining before the bottle was filled. Even the wisest bacterium probably could not recognize the problem at 11:55 a.m. because at that time the bottle was only 33% filled.

--Suppose that as late as 11:58 a.m. the bacteria discovered three new bottles which would quadruple the total space resources available to them. How long can growth continue until the new bottles are filled? Only four more doubling times, or four minutes at 12:02 p.m.

--Based upon evidence presented in the question above, what conclusions can we make about the use of resources if population increases exponentially? When consumption grows exponentially, enormous increases in consumption of resources occur in very short periods of time. For example, quadrupling the resource extends the life of the resource by only two doubling times.

--Again, ask students to identify important characteristics of exponential growth. Small absolute change initially, larger absolute change later in the progression, and numerical extremes.

LESSON 2: POPULATION AND RESOURCES

Introducing the Lesson

1. Distribute "World Population: 1 AD - 2000 AD" (Student Materials #4). Ask students the following:

--What two variables does this graph illustrate? Time and population.

--How does one identify the variables in a graph? Read the headings for each axis. A common error in the construction of graphs is incomplete labeling of axis.

--What happened to world population during the time considered by the graph? It has increased from 130 to 7000 million.

--When was the population smallest? 1 AD.

--When will it be the largest? 2000 AD.

--When did the population of the world seem to start increasing by large amounts? Sometime between 1800 and 1900.

--What was the total world population in 1 AD, 800 AD, 1600 AD, 1900 AD, 1950 AD, and estimated population for 2000 AD. In millions, 130, 500, 750, 2200, 3000, 7000.

--How much did the population of the world change during the 1800 years between 1 AD and 1800? Approximately 870 million.

--What was the population of the world in 1950? Approximately 3000 million.

--How much did the population of the world change in the 150 years between 1800 and 1950? It increased by approximately 1900 million.

--Can you tell precisely the population at any time from the graph? No. You can only approximate the total population.

--How do you figure the population at any time on the graph? By looking at the height of the bar and the scale on the vertical axis and estimating how high the bar is on the scale.

--What trend is illustrated by the data contained in the graph? Population has been increasing, very slowly, at first, but very rapidly during the last several hundred years.

--Compare this graph with the graph that students tried to make of their income. Are they similar or different? Similar. Does population seem to be growing exponentially? Yes. What is your evidence? A small initial amount of change, but increasingly large absolute change during the last several hundred years.

Developing the Lesson

2. The initial section of this module has focused upon the exponential growth in world population. Logically, the next step would be to examine the relationship between world population and world energy consumption. Unfortunately, statistics on world energy consumption are available only since 1960. Therefore, explain the construction and use of scatter diagrams and have students construct such a diagram plotting world population and energy consumption. The data for constructing the scatter diagram is derived from World Population and World Energy Consumption Tables (Student Materials #5). The horizontal axis of the scatter diagram should be labeled world population while the vertical axis should be labeled total world energy consumption.

A scatter diagram is a tool used by social scientists to help them to judge how closely two varibles CORRESPOND. If there is a strong POSITIVE CORRELATION between the variables, the scatter diagram will form a pattern which resembles figure A. If there is a close NEGATIVE CORRELATION, the scatter diagram will form a pattern which resembles Figure B. If there is little or no CORRELATION between the variables, the scatter diagram will not form a pattern but will assume a random distribution such as Figure C.

FIGURE A

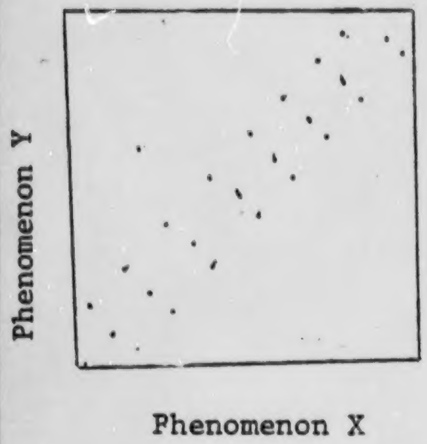


FIGURE B

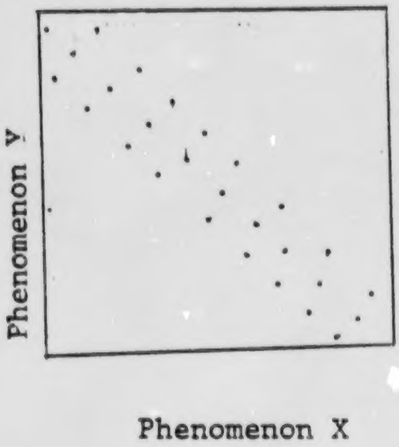
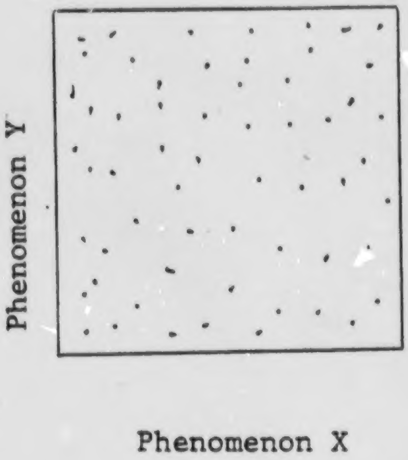


FIGURE C



It is important to indicate that correlation does not necessarily mean causality. Several items may exhibit a high positive correlation without having a causal relationship. For example, ice cream sales at the beach and drowning have a high positive correlation, but neither one causes the other. Rather, both correlate highly with a third variable, temperature, which maybe a causal variable.

3. Distribute Table of total U.S. Energy Consumption and Population 1920 to 1975 (Student Materials #6), and ask students to construct a scatter diagram with the horizontal axis representing population and the vertical axis representing total energy consumption in terms of BTU's.

4. After students complete their scatter diagrams ask them the following:

   --Is there a positive correlation between population and energy consumption? Yes. Can you think of any reason why a positive correlation might exist between population and energy? More people probably use more energy. Furthermore, the standard of living around the world is rising, and as more people enjoy a higher standard of living, they use even more energy. Since more reliable data about energy consumption and population exist for the United States, the next section will use data only from the United States.

   --Does there appear to be any CORRELATION between population and energy use? Yes. If so, is it positive or negative? Positive.

   --What does a POSITIVE CORRELATION mean? If one variable increases/decreases, the other will also increase/decrease.

   --In this particular situation, what does a positive correlation mean in terms of the two specific variables? If population increases, energy consumption also will increase, and vice versa.

   --In every year listed except one, population increased and energy consumption also increased. Can you offer any tentative ideas why energy consumption decreased between 1930 and 1935 although population increased? The impact of the Great Depression. Factories consumed less and home consumption also decreased because people couldn't afford to spend much.

   --Based upon the data in the table what predictions might you make for the future? Unless other variables exert an influence, it would appear that population and energy use will both continue to increase expenentially.

--What conclusions might you draw from comparing the example of the bacteria in the jar with the data in the table? Numerous conclusions are possible, including: both are examples of exponential growth, we face a problem similar to the bacteria because we are using energy at rates that increase exponentially, because of the characteristics of exponential growth, we may resemble the bacteria and not be able to recognize the exponential progression until we are very close to not having enough energy to maintain the global economy.

Concluding the Lesson

5. Distribute Population/Energy Resources 1900-2100 (Student Materials #7). Read each line of the graph separately. What trends do they illustrate? Energy resources are decreasing dramatically. After 2020 population also begins to decline. Hypothesize about the relationship between these two changes. Among the potential hypotheses is the following:

   NOTE: If students are unfamiliar with the concept "hypothesis," the teacher may take a few minutes to discuss it. A hypothesis may be described as an educated guess based upon current evidence. But it is subject to change, and should be tested by gathering additional data which may support or contradict the hypothesis.

   As population increased, energy resources dwindled until they reached a point at which they could no longer support the population. When this occurred, population was forced to contract.

6. Conclude by reviewing the following:

   --"Exponential growth" is one of the most important trends to understand when dealing with the problems that society faces. Here are a few of the things that tend to grow exponentially:

   1) population

   2) demand for scarce resources, such as energy

   3) inflation

--A quantity which is growing exponentially has a constant doubling time. This is, the quantity doubles at a set rate, just as your income doulbed. If the rate of growth of our pouulation is fixed at 2% our numbers will double every 35 years.

--A quantity growing expenentially within a limited environment appears to grow very slowly at first, and then to "explode" toward the limit. This creates a problem because it is contrary to normal intuition and creates a false sense of security until the limit has nearly been reached. There is a positive correlation between population and energy consumption. That is, as population increases, energy consumption will also increase.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in this module.

1. Exponential progressions can be used to describe many developments in the world around us. They may describe the rate of growth of human and animal population, and the rate at which we consume energy.

2. Exponential progressions are deceptive because the initial amount of change is very small, but later amounts of change are exceptionally large.

3. A quantity growing exponentially within a closed environment will show small absolute changes initially, but at later stages of growth, it will approach its limits relatively quickly.

4. Population and energy consumption within the United States are increasing exponentially.

5. There is a positive CORRELATION between population and energy consumption.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Have students grow fruit flies, a bacteria culture, or some other organism which grows exponentially. Use this as a class demonstration so that people observe it daily. Keep a chart plotting the growth of the bacteria or flies.

2. Have students investigate the origins of the population explosion which began in Western Europe and has now become global in character. What is the influence of changes in diet and medicine? Why do non industrial nations have such rapid increases in population? What is the role of religion, custom and tradition? Why are large families necessary in traditional societies?

3. Americans have often assumed that bigger is better. The teacher might divide the class into groups of 5-8 students to discuss that proposition. What are some truths and falsehoods about it? As specific examples, students might consider:

    a. Is a $10 bill better than a $5 bill?

    b. Is a 250-page book better than an 85-page book?

    c. Is a 95 on a test better than a 93?

    d. Is a flower garden with 60 roses better than one with 20 roses?

    e. Is a family with ten children better than one with five?

    f. Is a nation with 200,000,000 people better than a nation with 30,000,000?

    g. Is a man with 10 shirts better dressed than a man with six?

    h. Is a double dip ice cream cone better than a single dip?

4. How might your neighborhood change if the population doubled within thirty-five years? Your city, your state, your nation?

ENERGY CRUNCH

TEACHER SUPPLEMENTARY
MATERIALS #1

ENERGY PRETEST

Answers are circled.

1. How many years did it take nature to make coal?

   a. 100 years
   b. 1000 years
   [✓ c.] 1,000,000 years
   d. 1,000,000,000 years

2. How long does it take to burn a pound of coal in an average sized home furnace?

   [✓ a.] less than 5 minutes
   b. one hour
   c. 5 hours
   d. all day

3. If a loaf of bread cost 40¢ in 1974, and it increases in price by an inflation rate of 6% a year, what will it cost in 70 years?

   a. $2.56
   [✓ b.] $25.60
   c. it would double in price to 80¢
   d. $7.89

4. If you were to place a grain of wheat on the first square of a checkerboard, 2 grains of wheat on the second square, 4 on the third, 8 on the fourth, and so on, doubling the wheat grains on each succedding square, how many wheat grains would you need to put on the last square of the checkerboard?

   a. 500
   b. 5,000
   c. 500,000,000,000
   [✓ d.] 500 times the current annual wheat harvest of the world. An amount larger than all the wheat harvested in history of the earth! In just 63 doublings.

5. If you could fold a sheet of paper 49 times, how thick would the paper be?

   a. 490 miles
   b. several inches
   c. 22 miles
   [✓ d.] thick enough to reach the moon, 238,857 miles away.

ENERGY PRETEST

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DAILY CALENDER FOR YOUR JOB INCOME

1 $0.01	2 $0.02	3 $0.04	4 $0.08	5 $0.16	6 $0.32	7 $0.64
8 $1.28	9 $2.56	10 $5.12	11 $10.24	12 $20.48	13 $40.96	14 $81.92
15 $163.84	16 $327.68	17 $655.36	18 $1310.72	19 $2621.44	20 $5242.88	21 $10,485.7
22 $20,971.52	23 $41,943.04	24 $83,886.08	25 $167,772.16	26 $335,544.32	27 $671,088.64	28 $1,342,177.2
29 2,684,354.4	30 5,368,708.8					

STUDENT MATERIALS #2

THE BOTTLE

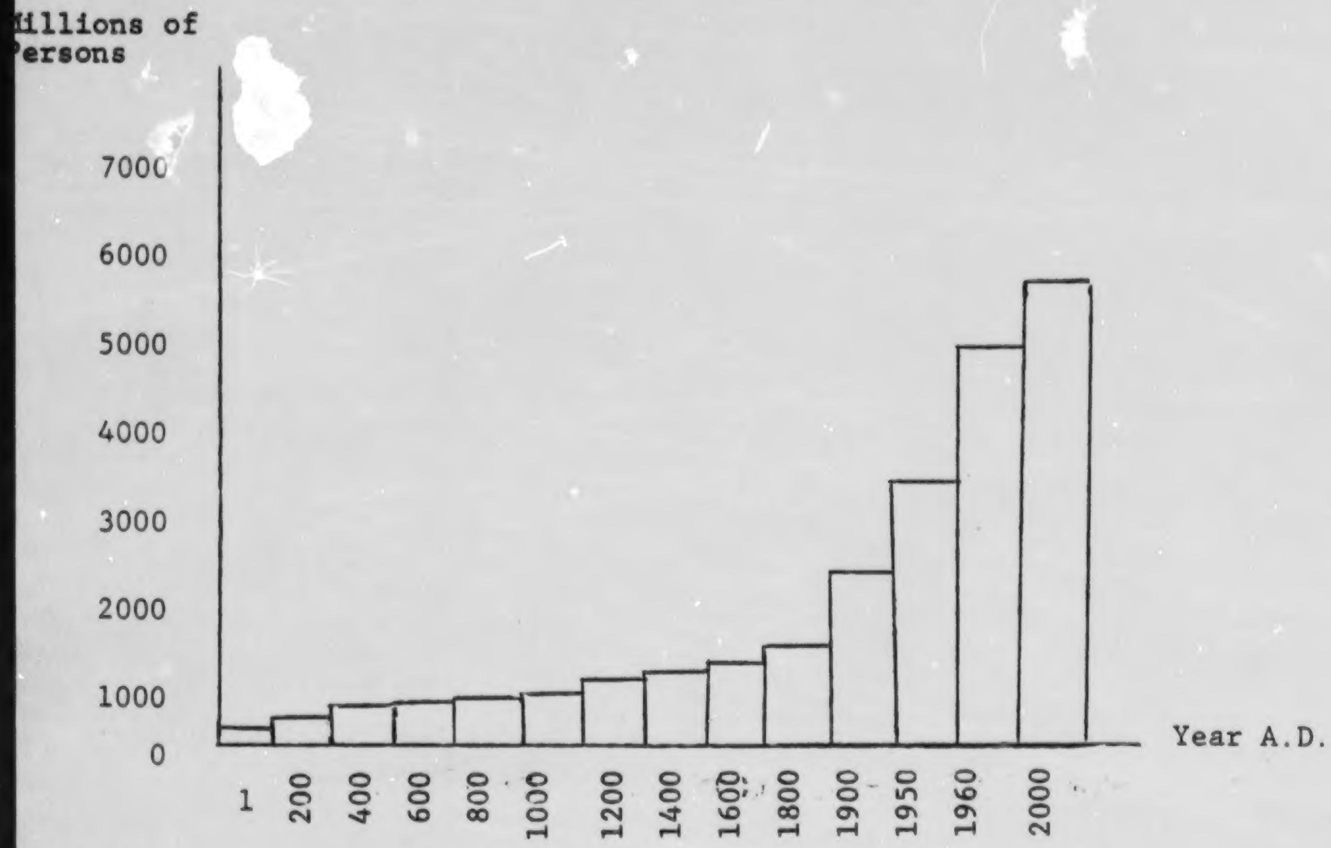
11:00 AM	1 Bacterium
11:55 AM	First bottle is 1/3 full
11:59 AM	First bottle is 1/2 full
12:00 Noon	First bottle is full
12:01 PM	Bottles 1 and 2 are both full
12:02 PM	Bottles 1,2,3, and 4 are full

NOTE: Growth of bacteria when doubling time is one minute.

Source: Albert Bartlett, "The Forgotten Fundamentals of the Energy Crisis."

WORLD POPULATION

1 AD - 2000 AD



Source: U.N. Statisical Yearbook.

ENERGY CONSUMPTION AND PRODUCTION

World Energy Consumption, 1960 to 1990 *

	1960	1965	1970	1973	1985	1990
World Total	131.7	163.4	216.9	250.3	346.5	406.1

COMPARATIVE INTERNATIONAL STATISTICS

World Population and Growth +

	1960	1965	1970	1975	1985	1990
World Total	3,030	3,288	3,610	3,967	4,816	5,279

* Totals given in quadrillions British Thermal Units (BTU's). A BTU is the amount of energy required to raise the temperature of a pound of water 1° farenheit. One quandrillon BTU equals 500,000 barrels of petroleum per day for a year or 40 million tons of bituminous coal or one trillion cubic feet of natural gas or 100 billion killowatt hours (KWH).

+ Totals given in millions of persons.

Source: Statistical Abstract of the United States, 1978.

TOTAL U.S. ENERGY CONSUMPTION AND POPULATION: 1920-1975

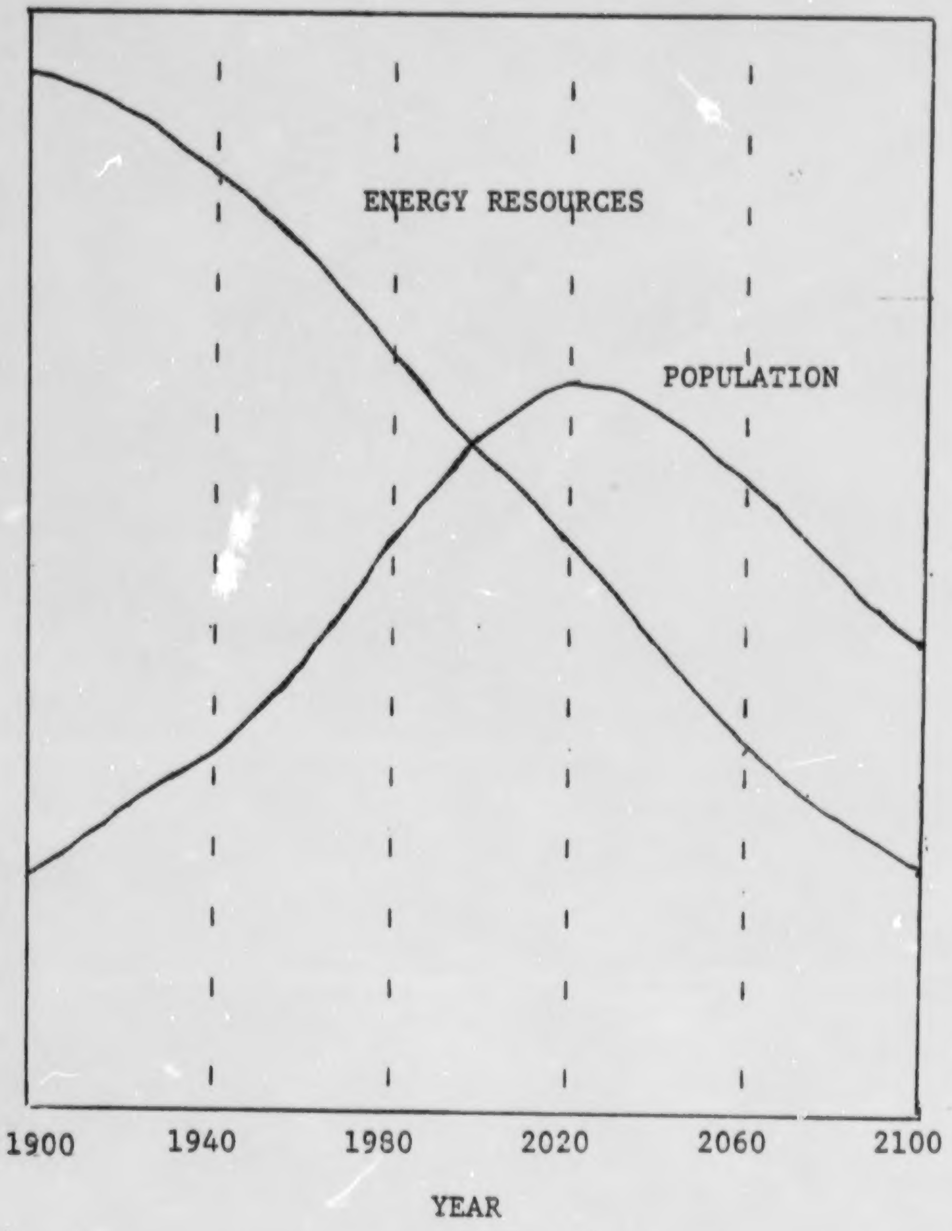
YEAR	ENERGY CONSUMED IN TRILLION BTU'S*	POPULATION IN MILLIONS
1920	19,782	106.5
1925	20,899	115.8
1930	22,288	123.1
1935	19,107	127.3
1940	23,908	132.6
1945	31,541	140.5
1950	33,992	152.3
1955	39,703	165.9
1960	44,569	180.7
1965	53,343	194.3
1970	66,909	204.9
1975	70,580	213.6

* A BTU is a British Thermal Unit which is the amount of energy required to raise the temperature of a pound of water one degree.

Source: Statistical Abstract of the United States, 1977 edition.

POPULATION/ENERGY RESOURCES

1900-2100



Source: Technology Review, Alumni Association of the Massachusetts Institute of Technology, Vol. 73, No. 3 January, 1971. (An Adapation)

CONSUMING ENERGY: THE U.S. VS. THE WORLD

A module for teaching high school students
about energy consumption patterns with
the aid of quantitative concepts.

Project QUESST
Boulder, Colorado
October, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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1. Energy Consumption and GNP Per Capita.
2. Reading for Energy Consumption.

OVERVIEW OF THE MODULE

Introduction

The use of private automobiles, airplanes, appliances, and expanding consumption of personal goods and services all contribute to the disproportionately large use of energy by Americans. Per capita, our society consumes more energy than any other society in the world. Although Americans as a nation consume more energy than any one else in the world, understanding American energy consumption patterns is a complex task. Industry, business, government, and private individuals all use energy, and the consumption patterns of these groups are inter-related. This module compares American energy consumption with the rest of the world and explores domestic energy consumption patterns. Interpretation of graphs and tables helps students to develop and evaluate the hypothesis that total energy consumption is a function of population size and standard of living, in this case measured by GNP per capita.

Description of the Materials

Courses and Topics:

Current Social Problems: Energy shortages.

Environmental Issues: Energy consumption.

Sociology: Energy consumption patterns.

Consumer Issues: Consuming energy.

Grade Level: 10-12.

Time Required: Two class periods.

Concepts and Skills:

Social Studies Concepts: Private vs. industrial energy consumption and economic inequality.

Quantitative Concepts: Percentage and correlation.

Thinking Skills: Comparing and inferring.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. List two reasons why the United States consumes a disproportionate share of the world's energy.
2. Differentiate between personal and industrial energy consumption.
3. Use percentages, graphs, and tables to decide how they can reduce personal energy consumption.

Sources of Data:

The Washington Center for Metropolitan Studies in Life Styles and Energy Surveys, 1972-73 was the source of data for American and world energy consumption. The Limits to Growth a report for the Club of Rome's project on the Predicament of Mankind, provided the scatter diagram comparing energy consumption and GNP per capita.

LESSON 1: HOW IS ENERGY DISTRIBUTED?

Introducing the Lesson

1. Divide the class into two groups whose relative sizes represent the populations of the United States and the rest of the world. After the two groups are formed, divide a quantity of cookies (energy) between them. The U.S. group receives 1/3 of the cookies. Have each group divide their share of cookies equally among all group members. Now randomly select some students from the world group and give them each three additional cookies--these students represent Japan, Germany, and other industrialized, high energy consuming nations.

   NOTE: If the class has 24 or fewer students, 1 student will represent the U.S. and all other students will represent the rest of the world. If the class has 25 or more students, 2 students will represent the U.S. In dividing the cookies, for every 1 cookie you give the U.S. group you should give the other group 2 cookies. Items other than cookies may be distributed, but they may not be as effective in stimulating student involvement.

2. Indicate to students that the distribution of the cookies is symbolic of a current world situation. It represents the energy distribution described in the following table which should be placed on the board or on an overhead transparency:

	PERCENT OF WORLD POPULATION	PERCENT OF WORLD ENERGY CONSUMPTION
U.S.	6%	33%
REST OF THE WORLD	94%	67%

3. Discuss the table by asking students:

   --What are some possible reasons that might explain the fact that the United States consumes so much of the world's total energy? There are many possible explanations, but the teacher should question until the following two explanations are offered: The U.S. has a relatively large population, and the population has a standard of living which allows members to own many goods.

--Do you think this pattern is fair? Why or why not?

NOTE: It is also possible at this point to ask students what they might do to make the distribution more equitable if they feel that such a step should be taken.

--What values are you using to make your decision?

Developing the Lesson

4. Write on the chalkboard the data from the previous table:

U.S. Energy Use/U.S. population (is in the ratio of) 33%/6%.

Rest of the World's Energy Use/Rest of World's Population (is in ratio of) 67%/94%.

Have students calcualte these ratio's.
Answers: 33/6 = 33 ÷ 6 = 5.5.

67/94 = 67 ÷ 94 = 0.7.

Now, have students compare the ratios.
Answer: The ratio of U.S. energy consumption compared to population/ rest of the world energy consumption compared to population = 5.5/0.7 = 55/7 = 7.9 or about 8

Now, ask students:

--What do these ratios mean? An average American consumes almost eight times as much energy as anybody else in the world.

--How are averages (means) determined? By summing all of the values involved and dividing that sum by the number of items.

--Suppose 5 people use 1, 3, 6, 7, and 8 units of power. What is the mean value? 5 units of power.

--Did anyone actually use 5 units? No.

--What happens to the average (mean) if we consider a sixth person who used 899 units of power? It becomes 154.

--What is a weakness of using the mean as a measure of average? Very large or very small figures can exert a distorting influence.

--Based upon this example, what might be some problems describing average American per capita energy consumption? Extremes of energy consumption will skew the data. If some energy consumers use very large or very small amounts, the mean measure of central tendency will not be very useful.

--Who might be some consumers of extra large amounts of energy? Business, industry, and government.

5. The calculations we made comparing mean American personal energy consumption with that of the rest of the world assumed that energy would be divided equally among all residents. However, this assumption is not valid. Some people or groups of people receive or use a lot more energy than other people or groups. In fact, they receive so much more energy that it throws our calculations off quite a bit.

   Place a copy of the table below on the blackboard or on an overhead transparency.

	POPULATION	PERSONAL* ENERGY CONSUMPTION	INDUSTRIAL* ENERGY CONSUMPTION
U.S.	6%	13%	20%
REST OF THE WORLD	94%	60%	7%
TOTAL	100%	73%	27%

*Percent of total world energy consumption

6. Discuss the table by asking the following questions:

   --Within the United States, does most of the energy consumed go to business, industry, and government; or to private individuals? Business, industry, and government.

--Where does most of the energy go in the rest of the world? Private individuals.

--Why might industrial and government consumption of energy be so high in the United States, and so low in the rest of the world as an average? Because the United States has an industrial economy, and that economy produces a wide variety of goods for consumers. However, additional factors may also be important since the rest of the world includes the industrial economies of Japan and Europe.

--Can you make a hypothesis about the relationship or correlation between energy consumption and industrial productivity? Yes. Energy consumption correlates positively with industrial productivity.

NOTE: The teacher may have to define hypothesis as an educated guess based upon evidence. However, this educated guess is tentative and should be tested by gathering additional information.

A scatter diagram is a tool used by social scientists to help them to judge how closely two variables CORRESPOND. If there is a close POSITIVE CORRELATION between the variables, the scatter diagram will form a pattern which resembles Figure A. If there is a close NEGATIVE CORRELATION, the scatter diagram will form a pattern which resembles Figure B. If there is little CORRELATION between the variables, the scatter diagram will not form a pattern but will assume a random distribution such as Figure C.

FIGURE A

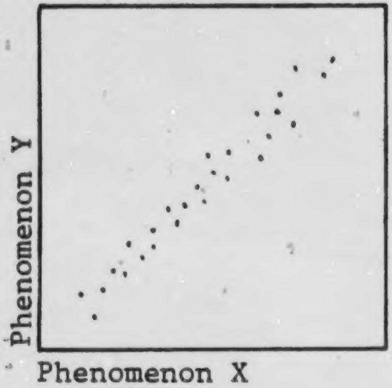


FIGURE B

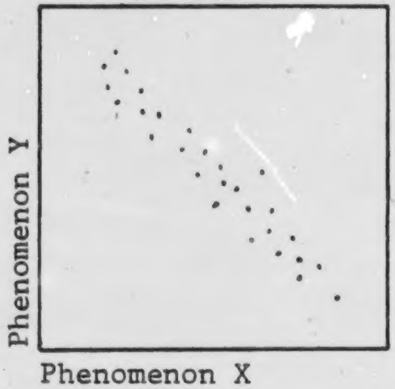
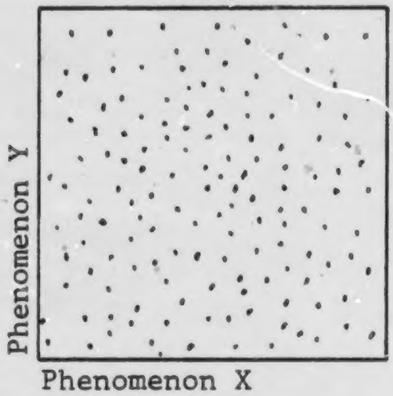


FIGURE C



It is important to indicate that correlation does not necessarily mean causality. Several items may exhibit a high positive correlation without having a causal relationship. For example, ice cream sales at the beach and drowning have a high positive correlation, but neither one causes the other. Rather, both correlate highly with a third variable, temperature, which may be a causal variable.

7. Distribute the scatter diagram of energy consumption and per capita GNP (Student Materials #1). Define the term GNP as Gross National Product or the total value of all the goods and services produced within a country in a year. Define per capita GNP as the GNP figure divided by the total population. Examine the scatter diagram by asking students:

--What does the horizontal axis measure? GNP per capita.

--What does the vertical axis measure? Kilograms of coal equivalent consumed per person per year.

--What is the GNP per capita of Sweden? $2,750.00.

--What is the per capita energy consumption of Sweden? 5400 Kg.

--What nation is closest to the U.S. in energy consumption? Canada.

--What are some other factors which may be positively correlated with energy consumption? There are many including number of factories, number of automobiles, number of power plants, steel production, standard of living, and many more.

--Does the scatter diagram support your previous hypothesis that there is a POSITIVE CORRELATION between energy consumption and industrial productivity? Yes.

--How can you explain this conclusion? The scatter diagram suggests that the higher a country's GNP, the higher will be its energy consumption.

--What do you predict will happen to total world energy consumption if more nations industrialize and attempt to emulate the life style of Americans? Energy consumption will increase dramatically. In fact, demand will probably far exceed supply.

--What might be some possible results if demands for energy far exceed supply? Energy shortages for many, declining standards of living, and possible conflict over control of energy sources.

--Does the conclusion that business and industry use most of the energy indicate that individuals really do not use that much energy? No, individuals may use 39.4% of the energy directly, but through their purchases of consumer goods they are indirectly responsible for most of the energy consumed by business and industry. Simply stated, if people didn't buy the goods produced by factories, the factories would not be consuming energy. Americans follow a lifestyle which allows many of us to own many goods produced by our factories. It takes energy to produce the finished product, but energy is also used at many steps between raw materials and the finished product. In addition, many of these goods, such as radios, televisions, and appliances, consume energy in their daily usage.

Concluding the Lesson

8. Distribute "Reading for Energy Consumption" (Student Materials #2). Read the short story and identify all of the direct uses of energy. Analyze each line separately. After identifying all of the direct uses of energy, analyze each line again looking for indirect energy usages. For example, it required energy to mine the iron ore, coal, and limestone that went into making the steel in the chain saw. It required energy to drill for the oil and convert it to gasoline to power the saw. It required energy for the lumberjacks to drive to work and to manufacture the clothes they wore. What other examples of indirect energy usage can you identify? Compared to other items such as television or automobiles how complex is the manufacturing process for pencils? What tentative conclusions might you make about energy consumption in other industries?

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered by this module.

1. The United States consumes a disproportionate share of the world's energy resources.
2. Over half of the energy consumed within the United States is consumed by business, industry, and government.
3. There is a strong positive correlation between per capita GNP, and energy consumption.
4. Individual consumers encourage energy consumption by purchasing goods which require the expenditure of energy to manufacture.

ADDITIONAL ACTIVITIES

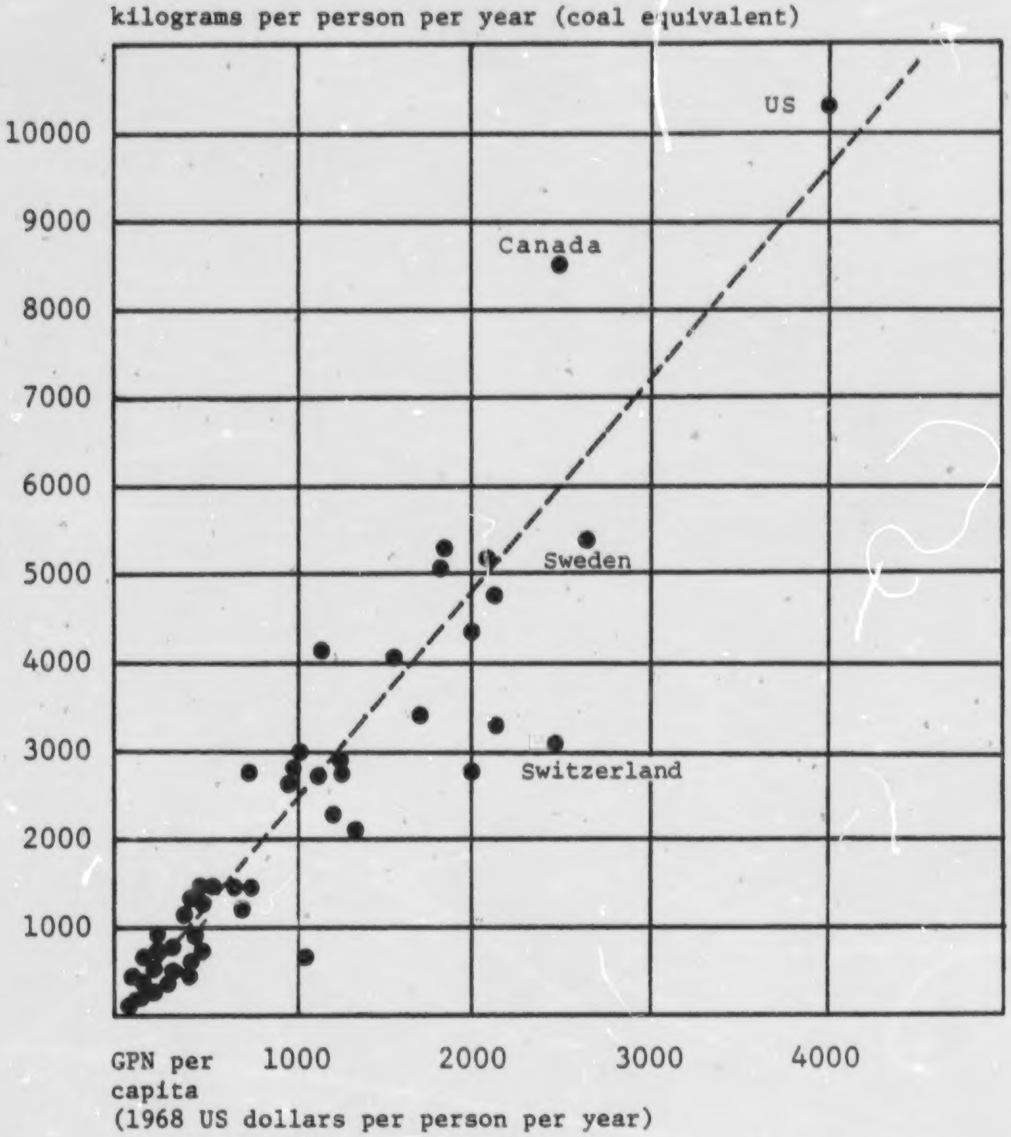
This activity may be used to supplement and expand the basic lesson of this module.

1. WHAT DOES COOKIE ENERGY REPRESENT (Day 1)

   Ask the class what forms of energy went into the processes needed to produce and distribute the cookies they consumed. List responses on the chalkboard. (Possible Answers: the human labour needed to plant, harvest and process grains, the heat needed for bakery ovens, vehicles needed to move raw materials and finished products.) emphasize that the energy symbolically consumed on Day 1 represents all these activities. Students can draw flow diagrams representing relationships among energy sectors to the economy sustaining the "cookie" industry and report back to the class.

2. Class discussion--What would happen if everyone in the world tried to use energy at the same level as Americans? What are the implications for natural resources, energy resources, foreign policy, pollution? Could this planet support the required level of energy and resource consumption? If so, for how long? How may the world change as other countries industrialize, or try to industrialize? How may these changes influence you?

ENERGY CONSUMPTION AND GNP PER CAPITA



SOURCES: Energy consumption from UN Department of Economic and Social Affairs *Statistical Yearbook 1969* (New York, United Nations, 1970). GNP per capita from *World Bank Atlas* (Washington, DC: International Bank for Reconstruction and Development, 1970).

READING FOR ENERGY CONSUMPTION

The giant pine crashed to the floor of the forest with a thunderous roar. As the noise of the chain saws faded, the two lumberjacks hoisted their small chain saws and began trimming off branches. While they were removing the last big branches a tractor lumbered up to the bare trunk and began to haul it away. After dragging the pine trunk for several miles, the tractor arrived at the saw mill where the trunk was cut into rough lumber. High-lifts transported the stacks of boards into a holding yard where the boards were stored until they could be transported by truck to a finishing mill. After examining some of the lumber in the yard a purchasing agent from the Stick Shift Pencil Co. returned to his car and scribbled a purchase order for several thousand pieces of lumber for his factory. The following day a company truck picked up the load of timber and took it to the pencil factory. At the factory each board was cut into smaller pieces. Each piece went through a machine which shaped it, inserted a piece of graphite, glued on another piece of wood, crimped an eraser on the end, and sprayed paint on it. Each pencil then was placed in a drying room where heated air was blown across the pencils. After drying, the pencils dropped onto a conveyor belt where they were channeled into packaging areas. Here, a large machine quickly packed the pencils into boxes. Each box then zipped down a conveyor belt where it was packed into a larger box. After repeated visits by a salesman from the Stick Shift Pencil Co., Dr. Hernandez, the superintendent, agreed that the Pleasant Valley School District would buy its pencils from the Stick Shift Co. The next Monday, a large truck pulled away from the loading dock at Stick Shift and delivered the pencils to the Pleasant Valley High School.

ENERGY: HOW IMPORTANT IN MY LIFE?

A module for teaching high school students
about energy consumption with the aid of
quantitative concepts.

Project QUESST
Boulder, Colorado
September, 1979

EXPERIMENTAL EDITION

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Supplementary Teacher Materials

1. Household Energy Use By Income Groups Key

Visual Materials

1. Picture #1 of Kasuper Family
2. Picture #2 of Kasuper Family

Student Materials

1. Household Energy Use by Income Groups
2. Energy Use Form
3. Appliance Operating Costs Table
4. Rank Order Form
5. Energy Use Continuum

ENERGY: HOW IMPORTANT IN MY LIFE?

OVERVIEW

Introduction

Who uses energy, how much do they use, and what types do they use? What groups will be hardest hit by inflation of energy prices? Which appliances use the most energy, and how can I reduce my personal energy consumption? This module examines these questions. It examines energy consumption by socioeconomic groups and asks students to predict which group(s) will suffer the most from rising energy costs. It also uses tables to display data about energy consumption and asks students to use their value systems to make choices which will reduce energy consumption.

Description of Materials

Courses and Topics:

Consumer Issues: Purchasing energy and consuming energy.

Current Social Problems: Energy consumption.

Environmental Issues: Energy consumption.

Sociology: Life styles of various social classes.

Grade Level: 7-12.

Time Required: Two class periods.

Concepts and Skills:

Social Studies Concepts: Energy consumption, economic and energy inequality, and necessities of life.

Quantitative Concepts: Rank order, estimation, and percentage.

Thinking Skills: Interpreting, evaluating, and comparing.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Identify three major sources of energy and recognize that different social groups use different types and quantities of energy.
2. Compare and interpret data presented in tables and graphs and correctly use the concept of percentage.
3. Identify how they and their families use energy, and how they can use rank order lists and their personal values to make decisions about what energy consuming devices they could most easily stop using.

Sources of Data:

The Washington Center for Metropolitan Studies in Life Style and Energy Surveys 1972-73 was the source for information about energy usage by various income groups. "Your Energy Budget Manager" from the Public Service Co. of Colorado, supplied the data about the energy consumption of various appliances.

LESSON 1: WHO USES WHAT?

Introducing the Lesson

1. Project the first slide of the Kasuper Family (Visual Materials #1). Ask students the following questions:

   --What does this picture show?

   --How do you think these people would react to a proposal to build an oil refinery near their home? They would be likely to oppose it.

   --What is your evidence? The many ecology conscious indicators in the picture.

   --Does this family appear to be more conscious of the ecology than most families? Yes.

   --What is your evidence?

   --Compared to other families, how much energy do you think this family uses? Less than average.

   --Why? How do you think they might try to conserve energy?

2. Project the second slide (Visual Materials #2) and explain that these items were found in the Kasuper House.

   --What does this picture show? Does it change your mind about the Kasuper family? In what way?

   --Based upon this picture what can you now say about the Kasuper family? Many things including the fact that they use a lot of energy.

   --What does this picture suggest about how dependent most of us are upon energy? It touches virtually every aspect of our lives.

   --How many of the items in the picture do you have?

   --Do you have any which are not in the picture?

   --What items do you think they would have to stop using to make a significant savings in energy? Before answering, you might want to consider what "significant" means in terms of a percentage reduction in power usage. That is, is a 1% reduction significant? A 5% reduction?

Developing the Lesson

3. Ask students: On what specific energy consuming items do you or your family spend money? Write responses on the chalkboard. For example: using automobiles, electric lights, home appliances such as television and stereo, home heating including hot water, and cooking fuel. Ask students to begin keeping a daily log of what energy consuming items they and their families use. Record the item, the time used, and who used it.

   NOTE: The logs will be used in Lesson 2.

4. Write "Gasoline," "Electricity", and Natural Gas" on the chalkboard. Select small groups (three to five students in a group), assign several groups to each of the three categories of energy named above, and have the groups decide which of the items previously listed on the chalkboard falls into their category.

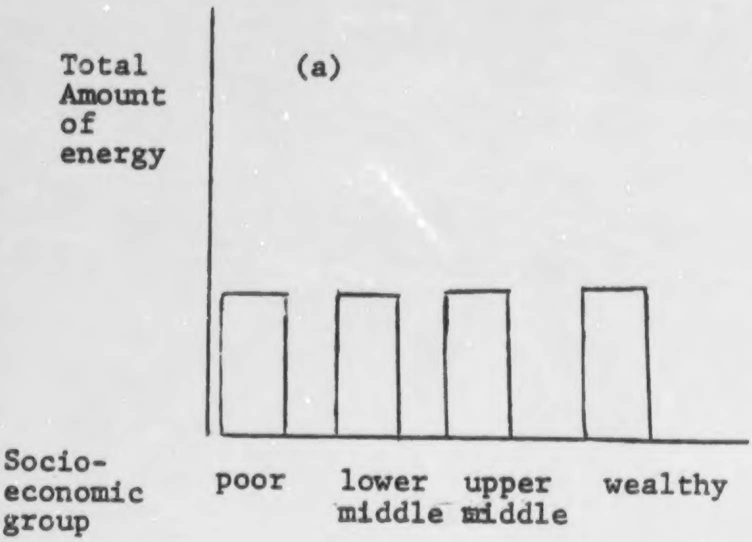
   Also ask the "energy groups" to brainstorm as many new items for their energy classification as they can. Write the lists which the different groups generate on the chalkboard.

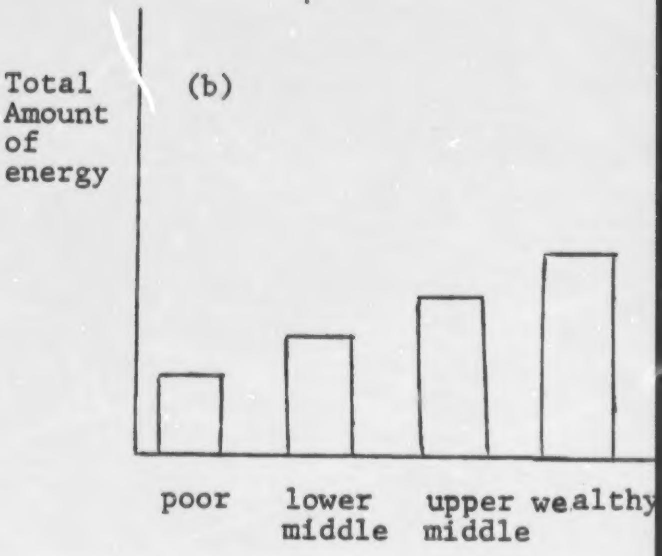
5. Construct the following three graphs on the chalkboard or use a transparency and overhead projector.

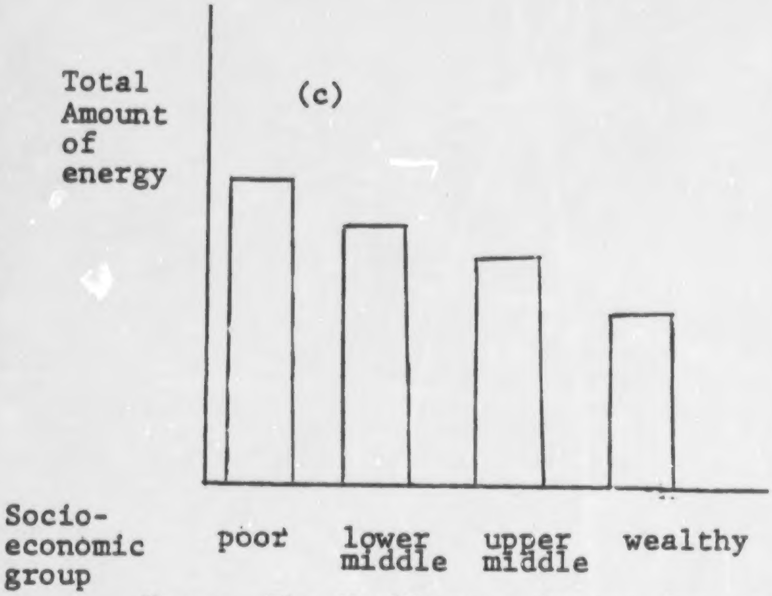
   --Which graph might realistically represent how much energy the different economic groups listed consume? Graph B.

   --Also ask why they selected the graph they chose? Poor people can afford less and so consume less.

   NOTE: The vertical axis of the graph represents a "total" amount of energy that takes into account all the different forms of energy discussed in Step 1. A unit which may be used to measure this "total energy" is the calorie. A calorie is the amount of energy required to raise the temperature of 1 gram of water 1° centegrade.







Note: The Washington Center for Metropolitan Studies in Lifestyles and energy uses 1972-1973 provides the following income definitions for socio-economic groups. As a result of inflation these guidelines may be inappropriate today.

Poor	$ 2,500
Lower middle	8,000
Upper middle	14,000
Wealthy	24,500

6. Which of the three major types of energy examined in Step 4 do you think is most unequally distributed (by the amounts used) among the different income groups? Have students give reasons or explanations for why they respond as they do. Write responses on the chalkboard.

   NOTE: Definitions of poor, lower middle, upper middle and wealthy were given in Step 5.

7. Distribute "Household Energy Use by Income Group" (Student Materials #1). Use the teacher answer sheet provided (Teacher Supplement #1) to lead the discussion. Have students compare their initial estimates of "which of the forms of energy is most unequally distributed" with their conclusions to questions 6 and 7 in Student Materials #1.

8. From the graph of Household Energy Use (Student Materials #1) we see that poor people consume less energy than do other groups, and the type of energy they use much less than other groups is gasoline. Construct the following table on the chalkboard or on an overhead.

	Poor	Lower Middle	Upper Middle	Wealthy
Average Income	$2,500	$8,000	$14,000	$24,500
Amount Spent On Energy	______	______	______	______
Percent of Income Spent on Energy	15%	7%	6%	4%

Have students compute the figures to be entered in the actual dollar amounts spent on energy by using the percent figures given on the bottom row.

POOR: 15% of \$ 2,500 = .15 x \$ 2,500 = \$ 375.

LOWER MIDDLE: 7% of \$ 8,000 = .07 x \$ 8,000 = \$ 560.

UPPER MIDDLE: 6% of \$14,000 = .06 x \$14,000 = \$ 840.

WELL OFF: 4% of \$24,500 = .04 x \$24,500 = \$ 980.

The completed table may then look like this (reversing the column and row headings to show students that the same data can be arranged in an alternate manner).

	INCOME	AMOUNT SPENT ON ENERGY	PERCENT OF INCOME SPENT ON ENERGY
POOR	\$ 2,500	\$375	15%
LOWER MIDDLE	8,000	560	7%
UPPER MIDDLE	14,000	840	6%
WEALTHY	24,500	980	4%

Concluding the Lesson

9. Pursue the energy issue by asking students:

What conclusions can you make based upon this table? Possible answer: The more income you have, the more you spend on energy. But the percentage you spend on energy is less the higher your income. This means that the poorer you are, the higher the percentage of your income that you have to spend on energy. This situation also means that poor people have a smaller percentage of their income left for non-energy purchases than other groups. With the rapid inflation in energy costs this problem is becoming even more accute. Cite the issue of how to provide energy relief for the poor!

--Do you think the present energy consumption pattern is the same as 1973 (indicated by the table)? Why or why not?

NOTE: In order to emphasize the importance of "percent" in explaining relative amount of income spent you can ask students:

--If each economic group spent $600 on energy would they spend the same percentage? No. Show that $600 means a larger part of a poor person's total income than a rich person's total income. One way of expressing "a part of" is by using percent.

--What are some of the reasons and possible explanations why poor people spend a greater part of their income on energy than do other income groups? Fixed basic costs of items such as heating, gas, and electricity which we all need.

--What might be other items on which poor people spend a relatively higher percentage of their income? Food, shelter, clothing, and in fact all the necessities of life.

--What are "necessities of life?" Food, shelter and clothes in sufficient quantity to maintain life.

LESSON 2: WHAT CAN I DO?

Introducing the Lesson

1. Ask students: Could you conserve energy if you had to do so? How might you conserve? Ask students to bring to class the log from Lesson 1 (Step 3) of energy using devices and their initial hypotheses about what they would have to give up to make a significant reduction in energy usage (Lesson 1. Step 2.)

Developing the Lesson

2. Distribute Energy Use Form (Student Materials #2) and Appliance Energy Costs Table (Student Materials #3). Have students list all of the items on the Energy Use Form that they have recorded in their logs. Also list any items that may be used regularly, but which were not listed in the logs. Using the logs as bases, have students estimate the amount of time each item on their lists would be used in a month. It is important to indicate to students that the Appliance Energy Cost Table uses different units for estimating costs. These include minutes, hours, days, months, and cycle. Students obviously cannot produce precise energy consumption records, but an approximation of family energy usage will be sufficient for this exercise. After students calculate the amount of time each item is used during a month, have them calculate the cost of that energy per item and total cost for all energy consumed during the month. These figures can be obtained by dividing the time per unit cost given by the table into the total time the family used that item and multiplying by the unit cost. For example:

   Griddle - \$. 016 per 30 minutes estimated usage 240 minutes per month.

   To calculate total monthly cost:

   $\frac{240 \text{ mins.}}{30 \text{ mins.}} = 8$ 8 x \$.016 = \$ .128 or about 13 cents to operate the griddle.

   Total energy cost per month is obtained by adding the costs of all of the items used.

3. Have students place a check mark beside the items they use and circle the items which their parents also used when they were the students' age.

4. Compute each students personal energy consumption and the total family energy consumption. Ask students:

   --What percent age of tht total do you use? Divide the total energy used into the student's part to find percentage of energy used by the student.

   For example, suppose the total energy consumption for the entire family was 4000 watts per month and your use was 1000. To figure percentage, you would divide 1000 watts by 4000 watts which equals .25 and multiply by 100 to equal 25%.

   --How much energy do you think you use compared to your parents when they were the same age? Probably more. Why do you use more energy? Because energy consuming items are more common. Also students may have more time to use them.

5. Have students underline the items which they think are essential for maintaining a quality life. There should be a discussion about what "quality" life means. Each student should develop a personal difinition of the term.

6. Distribute 2 copies of "Rank Order" (Student Materials #4) to each student. A rank order is a technique for organizing data in a logical manner. For example, data may be organized from highest to lowest or vice versa. Rank ordering, however, says nothing about the amount of distance between any items on the list. Have students list 10 most important items to them. Then make a list of the 10 least important items. Rank order each list. The rank order of the most important items would begin with the most important time. The rank order of least important items would begin with the least important item. Total the energy usage of each list of 10 items and subtract it from the total family usage. Compare the energy usage of the most important 10 with the least important 10. Which list has the items which use the most power? Probably the most important.

   --What does this imply about our ability to reduce power consumption and maintain the same style of living? It may be very difficult to do so.

7. Distribute "Energy Use Continuum" (Student Materials #5). Identify where your family would fall on the Energy Use Continuum.

   --How would your family's position on the continuum change if they stopped using the 10 least important energy consuming items, the 10 most important energy consuming items.

Concluding the Lesson

8. Ask students:

   --Are you a high , moderate, or low energy user? How about the other students?

   --How is the quality of your life related to the level of energy consumption? The higher the life style, the more energy you consume in current American society.

   --How would your life style be lowered by low energy usage?

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in this module.

1. There are three major types of energy sources, electricity, natural gas, and gasoline, used in contemporary America.
2. Energy consumption patterns vary according to socioeconomic group.
3. Percentages, graphs, and tables provide a useful means of presenting data about energy and students can compare and interpret this data.
4. RANK ORDER lists and personal values provide a basis for deciding how to reduce personal consumption.
5. Reducing energy consumption may influence the quality of life in America.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Contact local energy companies to obtain energy saving tips. Use these to conduct a 1-day course or energy fair to help other students learn how to save energy. The class might focus upon saving energy in each of the following areas: electricity, gasoline, natural gas.

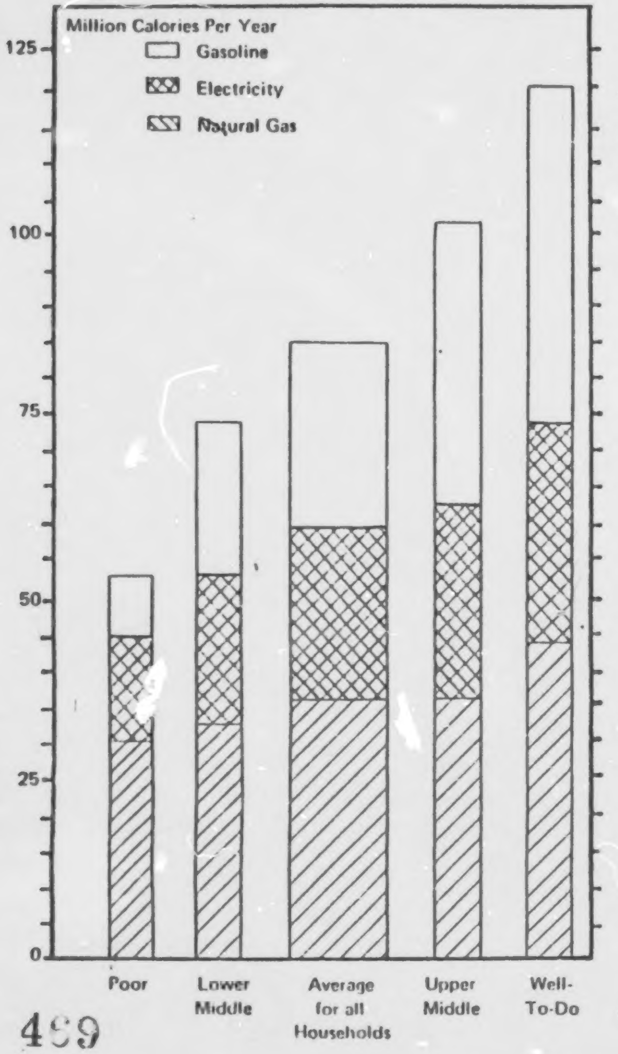
2. Students may investigate alternative sources of energy such as solar, alcohol, geothermal, wind, hydrogen, coal gasification, and garbage conversion. What are the advantages and disadvantages of each technique? How soon can these approaches be used commercially? Are alternative sources of energy a realistic possibility?

3. Students may investigate nuclear energy as an energy source. How safe is it? Can it meet our future needs? What are other nations doing in this area? Should we emphasize nuclear energy at the risk of failing to develop other alternatives? Is the Atomic Energy Commission a guardian of public interests or is it too friendly with the nuclear industry?

ENERGY: HOW IMPORTANT IN MY LIFE?

SUPPLEMENTARY TEACHER MATERIALS
#1

Household Energy Use by Income Group



Source: Washington Center for Metropolitan Studies.

Note: Includes only natural gas, electricity, and gasoline.

1. What do you notice about this graph? Jot down some things. (The more money you have the more energy you use. Also, see answer to Question 6.) Accept other answers that are reasonable.

2. What do the three sections of each bar represent? (see key upper left corner. Read each section of the bar. For example, the bar representing gasoline use runs from about the 60 mark to the 85 mark. 85-60=25 million calories of gasoline energy.

3. Where are "income groups" listed? On the baseline of the graph.

4. How is energy use measured on this graph? By millions of calories.

5. What is the average amount of energy used by all American households in 1972? About 85 million calories, more exactness is not necessary. Estimation is satisfactory.

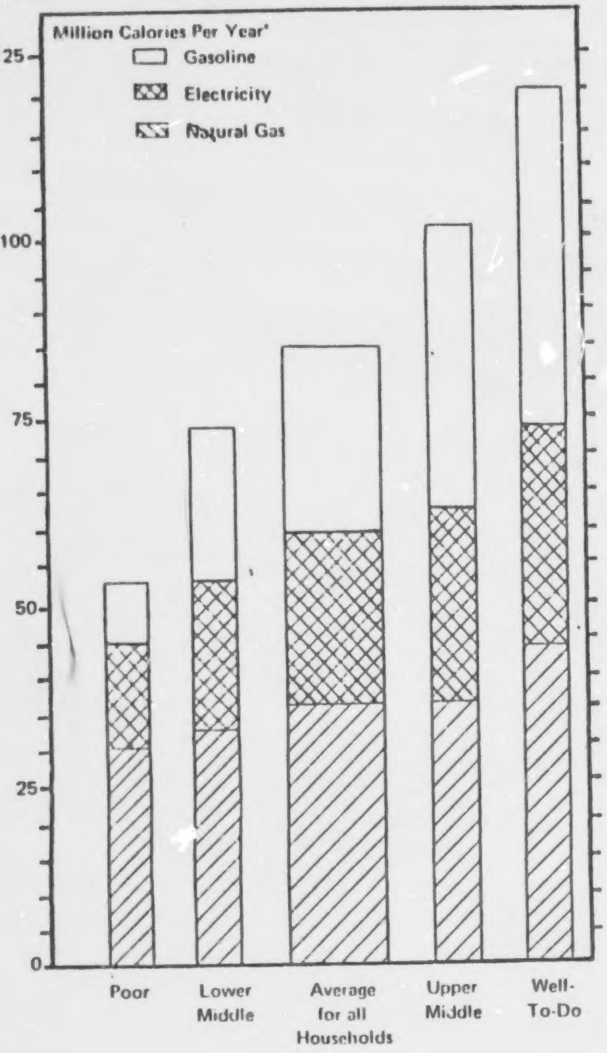
6. Which of the three types of energy pictured on this graph have more equal use among the different income groups? Electricity and natural gas.

7. Which of the three types of energy enjoys much greater use by higher income groups than lower income groups? Gasoline is used six times as much by the well to do than the poor.

8. Why do you think these facts are so? Well to do people can afford to take longer car trips for recreation. Also, they might commute to work by car, which requires more gasoline. They also drive bigger, less energy efficient cars!

Household Energy Use by Income Groups

Household Energy Use by Income Group



Source: Washington Center for Metropolitan Studies.

Note: Includes only natural gas, electricity, and gasoline.

1. What do you notice about this graph. Jot down some things.

____

____

____

2. What do the three sections of each bar represent?

____

____

____

3. Where are "income groups" listed? __________

____

____

4. How is energy measured on this graph? __________

____

____

5. What is the average amount of energy used by all American households in 1972? __________

____

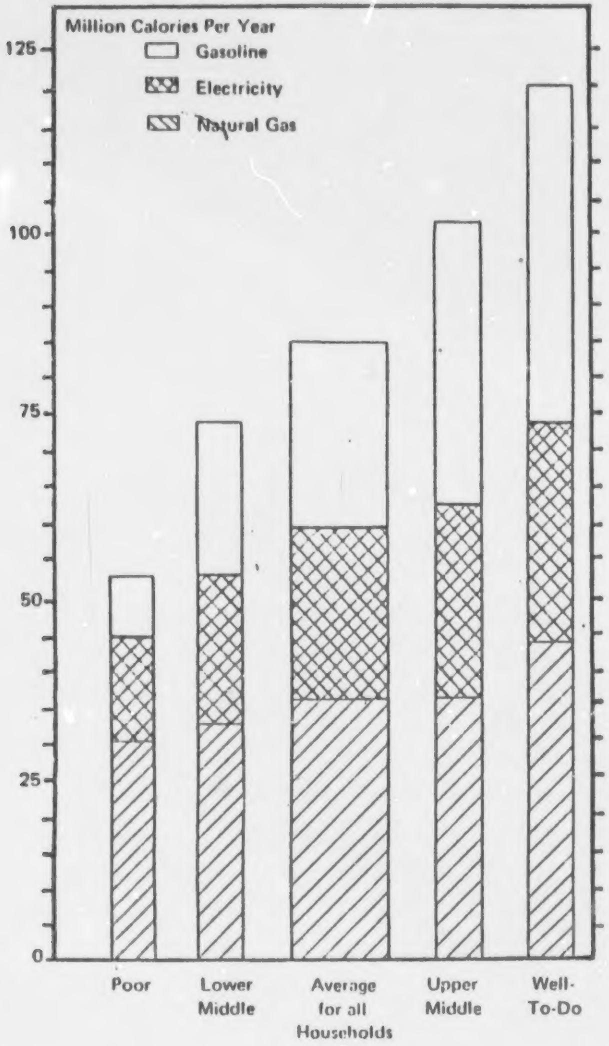
____

6. Which of the three types of energy have more equal use among the different income groups?

____

____

Household Energy Use by Income Group



Source: Washington Center for Metropolitan Studies.

Note: Includes only natural gas, electricity, and gasoline.

7. Which of the three types of energy enjoys much greater use by higher income groups than lower income groups? ____________

____

______________________________.

8. Why do you think these facts are so?

____

____

______________________________.

ENERGY USE FORM

ELECTRICAL PRODUCT (list below items from your log)	Number of minutes/hours/etc. you use per month	Place and "X" here is this item was used by parent/guar.	Number of minutes/hrs/etc. item was used by parents/guar.	Cost of Item in appropriate units (Includes Fuel Adjustment Cost)	Typical Wattage	Total Cost (Colorado) per month per item (No. min/hrs. X Cost per unit = total cost	Place an "X" in this column if you believe this item would be essential to your having an adequate quality of life	Cost per month to sustain your quality of life

ELECTRIC APPLIANCE OPERATING COSTS
. . . by the minute, by the hour
by the day, by the job

Electric Product	Typical Wattage	Cost	
Air Conditioner			
--One Room	900	$ .024*	hr.
--Living Room	1500	.040	hr.
--Multiple Rooms	3000	.082	hr.
Blanket	175	.025*	night
Blender	385	.0002	min.
Can Opener	100	.00006	min.
Carving Knife	92	.0003-5	min.
Clock	2	.052	month
Coffee Maker	850	.0052	10 min.
Curling Iron	40	.0003	15 min.
Corn Popper	575	.0052	15 min.
Deep Fat Fryer	1500	.033*	hr.
Diswasher	1200	.0253	normal cycle
Disposer	420	.0003	min.
Dryer	5000		
--Regular Fabrics		.1433	load
--Permanent Press		.1095	load
Furnance	660	.0242	hr.
Window Fan	200	.0073	hr.
Fondue/Chafing Dish	800	.0147*	hr.
Freezer (15 ct. ft.)	341	3.59*	month
--Frostless (15 cu. ft.)	440	5.33*	month
Fry Pan	1150	.0253*	hr.
Hedge Trimmer	265	.0049	30 min.
Garage Door Opener	350	.0002	min.
Grinder (Food or Coffee)	150	.0009	10 min.
Griddle	1200	.016*	30 min.
Hair Dryer (Hand)	600	.0217	hr.
Heating Pad	65	.00126*	hr.
Hi-Fi/Stereo	100	.0036	hr.
Humidifier	175	.0189	day
Ice Cream Freezer	130	.0036	45 min.
Iron (Hand)	1000	.0199*	hr.
Juicer	90	.00005	min.
Knife Sharpner	100	.00031	5 min.
Lights - 100 watt bulb	100	.036	10 hrs.
Make-up Mirror	20	.00018	15 min.
Microwave Oven	1500	.0136	15 min.
Mixer (Standing)	150	.0027	30 min.
Power Drill (1/4 inch)	240	.00073	5 min.
Saw	660	.00199	5 min.
Radio	75	.0027	hr.
Range			
--Small Surface Unit	1300	.0039	5 min.
--Large Surface Unit	2400	.0073	5 min.
--Oven (non-self-cleaning)	3200	.38*	hr.
--Broiler Unit	3600	.0326	15 min.
--Self Cleaning Feature	4000	.126 to .21.2	hrs.

ELECTRIC APPLIANCE COSTS
. . . by the minute, by the hour, by the day, by the job

STUDENT MATERIALS #3

Electric Product	Typical Wattage		
Refrigerator/Freezer (14 cu. ft.)	330	$ 3.44	month
--Frostless (17 cu.ft.)	350	5.16	month
Roaster	1350	.029	hr.
Sewing Machine	75	.00274	hr.
Shaver	14	.00004	5 min.
Shaving Cream Dispenser (Heated)	60	.00003	min.
Slow Cooker - Low	75	.0027	hr.
High	150	.0054	hr.
Space Heater	1300	.047	hr.
Sun Lamp	250	.0015	hr.
Television			
--Black and White Solid State	55	.002	hr.
--Color Solid State	200	.0073	hr.
Toaster	1200	.00144	2 min.
Toothbrush	7	.000004	min.
Trash Compactor	400	.0012	5 min.
Vacuum Cleaner	650	.0235	hr.
Waffle Iron	1200	.017	30 min.
Warming Tray	140	.0051	Hr.
Washing Machine (Automatic)	500	.0093	normal load
Water Heater (Quick Recovery)	4500	.08 to .21	per person/day
Yard or Post Lights Mecury (Bulb & Ballast)	120	.0477	night

GAS APPLIANCE OPERATING COST

Appliance	Typical Consumption (per hr.)	Cost (Includes GCA)	
Gas Clothes Dryer	20,000 Btu	$	
--Regular Fabric		.0465*	load
--Permanent press fabric		.0349*	load
Gas Grill	27,000 Btu	.045	hr.
Gas Light (two mantle)	2,200 Btu	.087	day
Gas Range - Surface unit	9,000 Btu	.015	hr.
--Oven	17,500 Btu	.029	hr.
--Broiler unit	14,000 Btu	.023	hr.
Gas Water Heater (40 gallons)	34,000 Btu	.012 to .032 . .	per person/day
Gas Furnace (100,000 Btu rated)	100 cubic feet	.14**	hr.

NOTE: The information on this and the next page was copied from a Public Service Co. pamphlet. It will be used to complete Handout 2, Energy Inventory.

*includes cost of electrically operated motor.
**assumes continuous operation for one hour.
***does not include pilot light consumption.

RANK ORDER FORM

Items Most (Least) Important to You from Handout 3:	Rank Order	Typical Wattage (from Hand-out 2)	Cost per month
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
TOTAL			

A rank ordering is a list of items arranged in an order according to some criteria. For example one could rank order methods of transportation from fastest to slowest. A supersonic airplane might be ranked first and an elephant ranked last.

ENERGY USE CONTINUUM

High Energy User	Moderate Energy User	Low Energy User
Over 36,000 Typical Wattage Total	12,000-15,000 typical wattage total	6800 typical wattage or less

Use Typical Wattage Totals from Handout 2

*These figures represent daily use.

cluster 6

WILL THE REAL AVERAGE AMERICAN FAMILY PLEASE STAND UP?

A module for teaching secondary
school students about variations
in the American family with the
aid of quantitative concepts and techniques.

Project QUESST
Boulder, Colorado
August, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Lesson 2: What is the Average American Family Like? . . . 10

Lesson 3: How are Families Changing? 16

Summary of the Module 23

Student Materials

1. Parents Think Families are in Good Shape and Psychiatrist Sees End of American Family.
2. A Sampling of American Families.
3. American Families.
4. American Families II: U.S. Averages.
5. Family Changes.
6. The Family and American Society.

OVERVIEW OF THE MODULE

Introduction

Frequently, one hears of references to the "average American family," but a search for such a family may prove to be futile. A large number of variables differ from family to family. Income, size, age, occupation, and a myriad of other measures may serve as the focus of attention when studying the family. This module will help students to recognize the variety of factors which vary among families and the value of some simple statistical concepts--mean, median, mode, and range--for summarizing those factors.

Although American families are extremely varied, there are some historical trends which are evident in American family life--e.g., average income has tended to rise and average family size has tended to decline. Using scatter diagrams, students explore factors which may have been associated with these changes. Finally, they explore some of their own attitudes toward the family and toward changes which have taken place in family life.

Description of the Materials

Courses and Topics:

Sociology: Family and ethnic studies.

American History: Contemporary social and economic history.

Urban Studies: Family and ethnic studies.

Civics: Family and ethnic studies.

Grade Level: 9-10.

Time Required: Three class periods.

Concepts and Skills:

Social Studies Concepts: Family, ethnic group, income, and occupation, and social change.

Quantitative Concepts: Average (mean, median, and mode), variable, Range (variability), and scatter diagrams (correlation).

Thinking Skills: Inferring, comparing, and evaluating.

Instructional Objectives:

At the conclusion of this module, the students will be better able to:

1. Cite and discuss reasons why variability is an important factor to be considered when analyzing any social phenomenon.
2. Explain that a measure of central tendency only partially describes a distribution of measurements.
3. Compute means, medians, and/or modes for given sets of data.
4. Cite reasons why it is useful to summarize multiple variables with a single measure.

1. Recognize and discuss trends illustrated on line graphs
2. Construct scatter diagrams based on data for two potentially related variables

Sources of Data:

The 1970 U.S. Census of Population and the 1976 edition of the Statistical Abstract of the United States were the sources of information for Student Materials #4. Figures for years after 1975 are estimates. The data may be updated by using more current Statistical Abstracts or the 1980 U.S. Census of Population as it becomes available.

The 1976 Bicentennial Edition of Historical Statistics of the United States, Part I was the source of the data in Student Materials #5 and # 6. This document is available from the U.S. Department of Commerce, Bureau of the Census. Student Materials #4 were excerpted from Raising Children in a Changing Society, a study of 1,230 families done by Yankelovich, Skelly and White, Inc. for General Mills, Inc.

LESSON 1: WHAT'S HAPPENING TO THE AVERAGE AMERICAN FAMILY?

Introducing the Lesson

1. This module focuses attention on the American family, what it is like, and how it has changed. Explain to students that many groups and individuals have expressed concern about the condition of American family life. They feel that the strength and influence of the family is being eroded by outside forces. Have the students read "Parents Think Families Are In Good Shape" and "Psychiatrist Sees End of American Family" (Student Materials #1). These articles reflect two different points of view on the question of how "healthy" the American family is. After they complete their reading, ask the students to defend one of these points of view with their own knowledge and experiences. You may wish to use the following two cases to stimulate discussion:

Case #1

Recently, a brother and sister paid a sixteen-year-old neighbor $60 to kill their father. After the father was killed, the two teenagers took his money and went on a buying spree. The police later arrested the pair on a tip from a family friend. When a psychiatrist examined these teenagers, he found that they were, in almost all respects, average kids from an average American family. There seemed to be nothing unusual in their background to help explain why they had their father murdered.

Case #2

Mike and Verna Swanson are the parents of twelve children. A visit to the Swanson household is like dropping in at the United Nations. Verna gave birth to three of the Swanson children, and the other nine are adopted. The twins were born in Columbia. One of the other girls came to the Swansons from Korea, another from Vietnam, and another from Pakistan. The oldest son is a Black American, two others are from Guatemala, and the youngest is from Greece. The Swansons say that their family is really just another average American family.

2. Allow students some time to comment on and react to these cases. These questions will also help guide the discussion of the cases:

   --Which point of view seems to be supported by these cases? They tend to support the psychiatrists arguments.

   --Do you think these cases are representative of large numbers of American families? Probably not.

   --Do you think the families described in these cases are average? Probably not. Explain to students that finding out about what the average American family is like will help in making a decision about whether it is "healthy" or on the verge of collapse.

3. Then, ask students to speculate on what the average American family is like. You might ask them to think about television shows which involve families. Which TV family is most typical? Which is least typical? Why?

   NOTE: Avoid a lengthy discussion of average or typical at this point. If students raise questions about these terms you should provide them with a quick definition, such as average--the mid point of a distribution--or typical--the most common value or characteristic. A more detailed treatment of average will occur later in the module.

Developing the Lesson

4. Distribute copies of "A Sampling of American Families" (Student Materials #1) to the students. Have them read the descriptions carefully, and then discuss the following questions:

   --In how many ways do these families differ from one another? The size, income, number of adults, number of generations, ethnicity, educational level, and martial status of the head of the family all differ among these families. Encourage students to cite other factors which differ. As they cite these factors, list each on the chalkboard. When the list is complete, explain to students that each factor is what social scientists call a - VARIABLE.

A VARIABLE may be defined as a characteristic which differs in value from case to case or time to time. The variable of family size in the five cases we have used may, for example, be summarized in tabular form as presented below:

Family	Number of Members
Chan	7
Carlson	5
Big Eagle	4
Kawalski	5
Stern	4

The variable--family size--remains constant, the value differs from case to case.

--Which family has the greatest number of children? The Carlson family.

--Is this the largest family? No.

--Which family is larger? Why? The Chan family has seven members, including the grandparents.

--What things can we learn about a family by knowing its size? Family size only provides information about the total number of people in a family, but it does not provide any information on age or relationship. Of course, there are many other kinds of information (sex, occupation, educational level) which are not provided in a reporting of family size.

--Which family has the highest income? The Carlson family.

--Which family lives in a rural place? The Kawalski family. The Big Eagles live in a small town, which could also be considered rural.

5. You may continue to ask questions like those above to insure that the students are thoroughly familiar with the data in the five cases, but keep the pace of this part of the discussion brisk. Then go to the following questions:

 --Which of these families is most like what you would consider the "average American family"? The Big Eagle family probably come closest to the national average in size, income, and educational level of the family head.

 --In what ways is the Chan family not "average"? Most students would probably cite the presence of grandparents as something that is not "typical" of American families. You might then ask for a show of hands to find out how many students in your class have grandparents living with them. Do the students' responses support or contradict the belief that American grandparents do not generally live in the same household with parents and their children?

 You might follow the same questioning procedure with other variables.

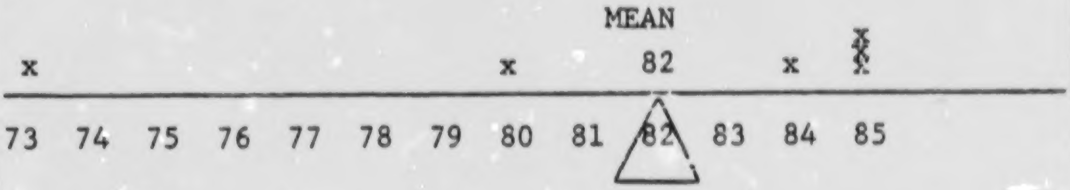
6. At this point it is important to clarify what is meant by average. This may be done by using the data in "A Sampling of American Families" (Student Materials #2). Hand out copies of "American Families" (Student Materials #3). Have the students complete the Family Size column (column 1) as follows:

Family	Family Size
The Chans	7
The Carlsons	5
The Big Eagles	4
The Kowalskis	5
The Sterns	4

7. Next, they should total the scores (number of people). In this case the total is 25. If the students divide this total by the number of cases (families) -- 25 ÷ 5 = 5 -- they will find that the average family size is 5.

 Explain that this arithmetic average is called the MEAN.

The MEAN is the most common type of average used in everyday life. Since it takes into account all cases, it is a good measure to use in many areas such as family size and points scored in basketball. The mean is defined as the arithmetic average or the sum of the values divided by the total number of cases. It may be thought of as the balancing point of a see-saw. Thus, for example, if we distributed a student's scores on six history tests on the board, the mean would be the fulcrum or balancing point for the see-saw, as shown below:



8. Now, list the families on the chalkboard in order from largest to smallest as shown here:

Family	Family Size
The Chans	7
The Carlsons	5
The Kowalskis	5
The Big Eagles	4
The Sterns	4

Another way to find a "typical" case is to locate the mid-point in a distribution. Here we would count to the third case--again, 5 is the typical family size. This kind of measure of "typicalness" is called the MEDIAN.

The MEDIAN is not generally used as much as the mean. It is, however, the best measure of typicalness or central tendency for data that involve a few extremely high or low scores. Since income is usually distributed that way (e.g., a few millionaires and many people earning $12,000), median is generally considered a better measure to use for income. The median is not always one of the scores in the distribution. The median score for the six history tests is 84.5--the point at which half the tests are above and half are below. The median in an odd numbered distribution is the middle number when they are listed in sequence. In a similarly ordered even-numbered distribution, the median is the average of the two middle values.

85

85

85

_______ 84.5 = median

84

80

73

9. Have the students complete the Occupation of Family Head column (column 7). This will be:

Family	Occupation of Family Head
The Chans	Loan Officer
The Carlsons	Vice President
The Big Eagles	Farmer
The Kowalskis	Farmer
The Sterns	Housekeeper

When they have completed this column, ask the students:

--Can you compute a mean or median for this variable? No.

--Does this mean that there is no way of measuring "typicalness" in a distribution such as this one with no numerical scores? Obviously, this will be a difficult question for students. Encourage them to suggest ways in which "typicalness" could be measured in this kind of distribution. Someone is likely to mention that the occupation that is most frequently recorded might be considered the most typical. In this case that occupation would be "farmer". This measure of central tendency is called the MODE.

> The MODE is the specific score which is recorded most often. A major weakness of the mode is that is does not necessarily fall near the center of a distribution. In a distribution of variables such as clothing style or occupational categories, the mode is a useful measure of central tendency. The mode is used rather than the mean or median when a measure of the most characteristic value of a group is desired. The meaning of "the most characteristic value" is illustrated by clothing fashions. The mode is the style which is worn by the greatest number of people.

Concluding the Lesson

10. Ask the students to offer some reasons why knowing averages might be useful. Among the points they should mention are:

    - An average summarizes a great deal of information in a single measure.

    - Averages make it easier to make comparisons of different populations.

    - Averages may be useful in recognizing trends over time.

LESSON 2: What is the Average American Family Like?

Introducing the Lesson

1. Review with the students the concepts of mean, median, and mode. You might, for example, ask the following question:

--What measure of average is most useful when considering each of the following factors? Why?

Family Size	--Mean because it takes into account each individual case.
Family Income	--Median because it it less affected by extreme numbers--e.g,, millionaires.
Occupations	--Mode because it provides information on the most frequently held occupation.

Developing the Lesson

2. To help students more clearly understand these concepts divide the class into six small groups. Have each group focus its attention on one of the remaining columns of "American Families" (Student Materials #3). Each group should complete its column and compute at least one measure of central tendency--mean, median, or mode--for that variable. You may make a transparency of the blank table, reconstruct a blank table on a large sheet of paper, or draw such a table on the chalkboard. Then, as each group completes its task, they may fill in the appropriate spaces on the table. The completed table should include the following figures:

AMERICAN FAMILIES

	Family Size	No. of Children	Family Income	Yrs. of School Completed	Size of Dwelling	Age of Family Head	Occupation of Family Head	Head of Household	Other Factors
The Chans	7	3	$27,000	16	3 Br. Apt.	52	Loan Officer	Male	
The Carlsons	5	4	$50,000	18	4 Br. House	42	Vice Pres. of Company	Male	
The Big Eagles	4	2	$12,000	12	2 Br. House	38	Farmer	Male	
The Kowalskis	5	3	$30,000	9	5 Br. House	35	Farmer	Male	
The Sterns	4	3	$ 6,000	11	1 Br. Apt.	35	Housekeeper	Female	
MEAN	5	3	$25,000	13.2	3 Br.	40.4	—	—	
MEDIAN	5	3	$27,000	12	3 Br.	38	—	—	
MODE	4 & 5	3	—	—	— Houses are the mode	35	Farmer	Male	

BEST COPY AVAILABLE

3. After the table has been completed, use the following questions to guide a discussion:

--For which variable is the least diversity reported? Why? Head of household since it has only two response categories--male or female.

--Why is there no mode reported for family income, years of school completed, or size of dwelling? In each case there are five different values reported, no value occurs more frequently than any other.

--Why is the mode a misleading measure of average for age of family head? 35, the modal category. Is also the lowest age recorded in this distribution. The median, 38, is less affected by the extreme case (52) than is the mean, 40.4.

--For which variable is the greatest RANGE reported?

> The RANGE is a simple measure of variability. It is the difference between the highest value in a distribution and the lowest value in that distribution. The range for family size for example, is 7 - 4 = 3.

The greatest range is reported for family income. This is also due in part to the measure being used. Obviously, no one is likely to have a house with thousands of bedrooms; on the other hand, measuring size of dwelling by square footage of floor space may well yield a wider range than that reported for family income.

--Why is it important to know about the range of a distribution as well as the average value of a variable? The average only represents an abstract mid point, it does not provide much information about the extremes of a distribution. In some cases two very different distributions may have the same means. Sometimes knowing only the means of two distributions might lead to mistaken conclusions. Have the students consider the following example:

Johnson's Carpet Cleaning

Frank Johnson started his company in 1928. He runs the place with an iron hand. There are 10 people including Frank, working for the company. The average annual salary in the company is $25,000.

Gonzales' Carpet Cleaning

Chico Gonzales and his brother Sam started their company three years ago. Since that time they have hired eight other employees. They work along side the others and are well liked by these employees. The average annual salary in the company is $17,000.

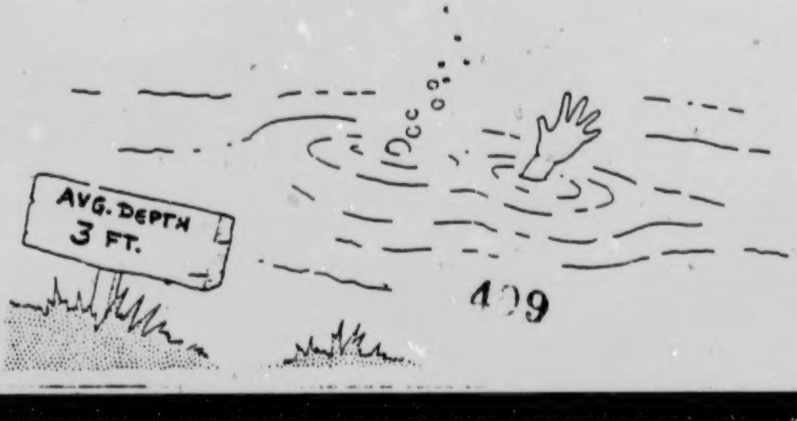
--For which company would you rather go to work? Why? Students might suggest that working conditions would be better in the Gonzales company but salaries higher in the Johnson Company. Then present these figures:

Frank Johnson, President	111,500
Paul Kahn, Accountant	38,000
Bob Ramos, Manager	35,500
Bill Peters, Cleaner	12,500
Mary George, Cleaner	12,500
Martin Davis, Cleaner	8,000
Susan Malloy, Cleaner	8,000
Juan Martinez, Cleaner	8,000
Peter Burns, Cleaner	8,000
Donna Glass, Cleaner	8,000

Chico Gonzales, President	30,000
Sam Gonzales, Vice Pres.	25,000
Carol Bremmer, Accountant	20,000
Jenny Patrick, Cleaner	14,000
Kim Hsu, Cleaner	14,000
Jim Waters, Cleaner	13,500
Jesse Washington, Cleaner	13,500
Lynn Pina, Cleaner	13,500
Tony Clonger, Cleaner	13,000
Fred Marple, Cleaner	13,000

--Would knowing the range for each distribution have been useful in making up your mind? Why? Yes, because it would have provided information about the kind of salary a beginning employee could expect to earn.

4. To conclude the discussion show the class the cartoon below and ask them to suggest other cases where knowing the average value of some variable would be insufficient:



Concluding the Lesson

5. Ask the students to select three or four of the categories from "American Families" and compute averages for the families represented in class. Compare the class averages to those on "American Families."

6. Now, pass out "American Families II" (Student Materials #4) and focus a discussion on the following questions:

--Considering the averages for the five families we studied, for which variable is our average closest to the national average? Years of school completed (median).

--Considering the families represented by our class, for which variable is our average closest to the national average?

--For which variable is the sample average farthest from the national average? Family income (median).

--For which variable is our class average farthest from the national average?

--Have we learned anything about our sample? If so what? The discrepencies indicate that our sample was not representative of the U.S. family population as a whole.

--What other major discrepancy(ies) were there between our sample and the national averages? For one thing, our modal occupation group was farmer while the national modal group was craftsmen.

7. To reinforce the importance of variability in the study of American families, have the students turn their attention once again to "American Families" (Student Materials #3). The far right-hand column, "Other Factors," has been left blank. Take some time now to fill in this column. Factors such as those listed below should be mentioned:

-number of adults in family
-geographic location
-age of children
-rural, urban, suburban
-number of people employed
-marital status of parent(s)
-own or rent dwelling
-ethnic identity

You may then continue to brainstorm other variables which may be considered when studying families. Some examples are:

-religion
-national origin
-mobility
-children by birth or by adoption

Then, ask the students to speculate on how a change in one factor may affect other factors. Explain that this will be the focus of the next lesson.

LESSON 3: How Are Families Changing?

Introducing the Lesson

1. Review with the students some of the points about the average American family as it was in 1970. These include:

   -Modal Occupation Group of Family Head - Craftsmen/Kindred workers

   -Family Size - 3.59 (Mean)

   -Family Income -$14,958 (Median)

   -Educational Level of Family Head - 12.1 yrs. (Median)

   Students should be encouraged to update these figures with more current statistics from recent Statistical Abstracts or other sources.

2. Remind students that this module began by considering how "healthy" the American family is. Ask them to suggest family variables which have not yet been considered but which indicate how strong the family is. Among the factors they may mention are:

   -Divorce Rates
   -Incidence of Child Abuse
   -Church Attendance
   -Working Mothers
   -Unemployment

3. Encourage the students to speculate on how each of these factors is related to the well-being of the American family. Explain that the next part of the lesson will help them to understand how closely some of these factors are related to each other.

Developing the Lesson

4. Distribute copies of "Family Changes" (Student Materials #5). Have the students look closely at the four line graphs, and discuss the following questions:

--How do the factors on these line graphs appear to be related to one another? Family size has decreased as income has increased. Divorces have increased while income has increased. Encourage students to identify other apparent relationships.

--Does the fact that both the divorce rate and average income have increased mean that one causes the other? No, in fact, they may both be caused by some other factors which have not been considered. Probe a little further on this point.

--What was happening in 1945? Among other things, World War II was just ending.

--What was taking place in 1970? Again, the U.S. was involved in a war; this time in Vietnam.

--Could these wars have influenced divorce rates and income? If so, how? Yes. The U.S. was near full employment at both these times, and the strain of separation created when men went to war was a prime factor leading to divorce.

--Do the line graphs provide a clear picture of how closely these factors are related to one another? Not really, they merely indicate that growth or decline in each factor occurs during a particular time period.

5. Now, explain that scatter diagrams are a more effective way of illustrating relationships between two variables.

A scatter diagram is a tool used by social scientists to help them to judge how closely two variables are associated. If there is a close POSITIVE CORRELATION between the variables, the scatter diagram will form a pattern which resembles Figure A. If there is a close NEGATIVE CORRELATION, the scatter diagram will form a pattern which resembles Figure B. If there is little CORRELATION between the variables, the scatter diagram will not form a pattern but will assume a random distribution such as Figure C. The closer the correlation, the more the pattern will approximate a straight line.

FIGURE A

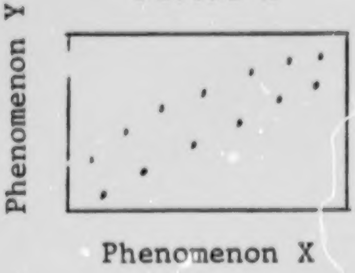


FIGURE B

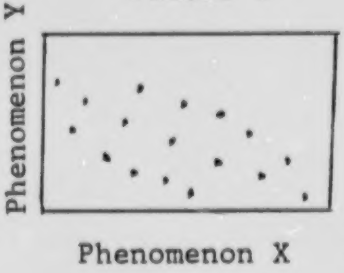
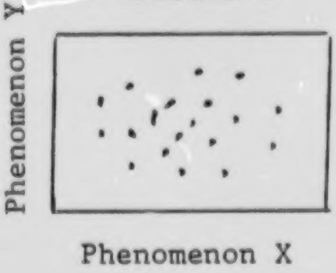


FIGURE C

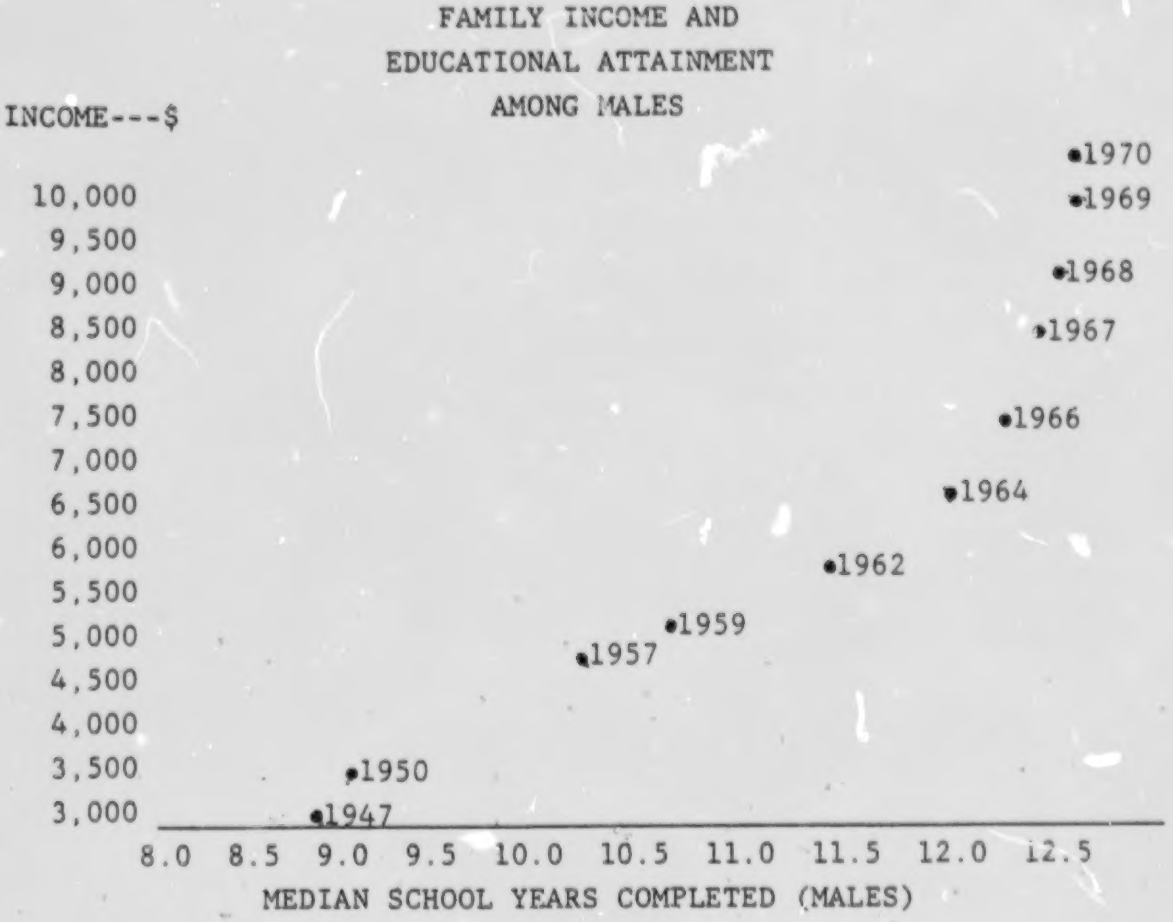


It is important to indicate that correlation does not necessarily mean causality. Several items may exhibit a high positive correlation without having a causal relationship. For example, ice cream sales at the beach and drowning have a high positive correlation, but neither one causes the other. Rather, both correlate highly with a third variable, temperature, which may be a causal factor.

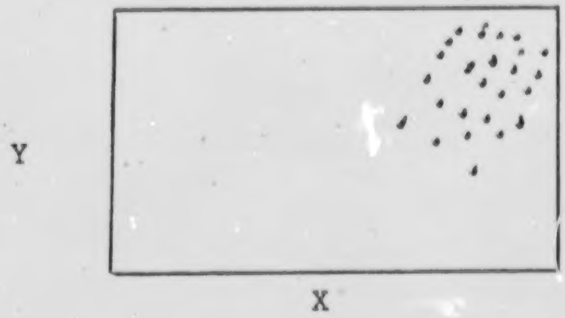
6. For the next part of the lesson, have the students work in seven groups. Each group will construct on posting paper a scatter diagram illustrating the relationship between two variables. The groups should use the data in "The Family and American Society" (Student Materials #6) in constructing their scatter diagrams. The groups may divide the data as follows:

Group	Variable X Horizontal Axis	Variable Y Vertical Axis
1	Years of School Completed	Median Family Income
2	Married Women in Labor Force	Divorce Rate
3	Unemployment	Divorce Rate
4	Years of School Completed	Average Fam. Size
5	Unemployment	Median Fam. Income
6	Unemployment	Average Fam. Size
7	Median Family Income	Child Welfare Services

Each group's scatter diagram should be set up as illustrated here:



The students will have to decide how to set up the intervals for the scale on each axis. Point out to them that they should try to avoid wasting space by always starting the scales at zero; this can often result in a scatter diagram that looks like this:



Since all the tables do not record figures for exactly the same years, students should use only the years for which they have scores for both variables they are considering. They should label each dot with the appropriate year. This will enable them to more easily identify years which seem not to fit the general pattern (if any) illustrated on the diagram.

7. When they have completed their scatter diagrams, have the groups post their work so the class can see them. The following questions may be used as a discussion guide:

--Which of the correlations illustrated on the scatter diagrams appear to be strongest? School Years Completed and Family Income, Married Women in the Labor Force and Divorce Rate, and Family Income and Child Welfare Services.

--Which seemed to be the weakest? Probably Family Size and Unemployment.

--On the basis of the scatter diagram, is it possible for us to say that an increase in education causes an increase in income? Why or why not? No, it is not possible to draw this conclusion. First, a correlation simply indicates that two variables are associated; their correlation may be explained by similar responses to a third variable. Furthermore, two variables may interact in a complex way; for example, increased income may allow children to stay in school longer, the greater education may help an individual to find a better paying job.

--Obviously, a family's income is affected by unemployment. If this is the case, why does the relationship between Median Family Income and Unemployment appear to be so weak? Although the rate of unemployment may seem high, it may not be great enough to significantly influence the Median Family Income throughout the country. Furthermore, income has been increasing steadily over the years and is influenced by a great many other factors, such as inflation. This further illustrates the point that correlation does not necessarily suggest causality.

8. Allow the students to suggest other questions raised by the scatter diagrams. They should be clear that scatter diagrams are useful tools for visually illustrating the degree to which two variables are correlated. Explain that one major drawback of this technique is that it only allows the investigator to consider two variables at a time. In reality, however, one variable may be influenced by several others. To make this point clear, ask the students:

--How many different factors might influence family size? Among the factors students might mention are income, educational level, divorce rate, unemployment; in other words, many more than can be shown on a scatter diagram.

Concluding the Lesson

9. To this point the students have looked at ways in which families have changed over the past 30 years or so. You may ask them to summarize these changes. The points which should be mentioned are:

--Incomes have increased.

--Average size appears to be decreasing.

--Divorce rates are increasing.

--Educational attainment is increasing for both males and females.

--Child welfare services have become more extensive.

--An increasingly greater percentage of women with children are active in the labor force.

10. So far they have talked about how these factors may be associated (correlated) with one another. The data we have used so far have only been up to 1970. Point this out to students, and ask:

--Do you think most of these trends are continuing? They will probably say yes, and most are, indeed, continuing.

--Which of the following statements best summarizes what has been happening to the American family over the past 30 or 40 years?

A. The family is disintegrating.

B. The family is becoming more important in our society.

C. The family is becoming less stable.

D. More and more people are becoming dissatisfied with family life.

E. The family is doing a very effective job of raising children to function in American society.

Allow students sufficient time to discuss these points. They should support their opinions with information from the data used so far in the module and whatever other data they can cite. For example, a student asserting that point E is false may claim that the increase in child welfare services and the increase in working mothers both indicate that the family in itself is not effectively raising children. Encourage students to consider a wide range of factors, and be accepting of their answers.

--Do YOU think the family is becoming more or less important in our society? Why?

--In how many ways is the family influenced by conditions and events in the general society? Allow students time to discuss this question thoroughly; they should cite examples whenever possible.

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--In how many ways is the family influenced by conditions and events in the general society? Allow students time to discuss this question thoroughly; they should cite examples whenever possible.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. A large number of variables--family size, income, ethnic identity, etc.--differ from family to family in our society. It is possible to compute averages of one kind or another for each variable.

2. MEAN, MEDIAN, and MODE are three commonly used measures of central tendency or average. Each has particular advantages. The mean takes into account all cases and specific scores. The median is less affected by extreme scores. The mode provides information on the most frequently recorded score or value. Each of these measures of average summarizes a great deal of data in a single number. This makes it possible to compare one set of cases--e.g., families in 1940--to another set of cases--e.g., families in 1980.

3. There is a very wide RANGE among American families with respect to most variables. Considering the average without also considering the range or other measure of variability may well lead to incorrect conclusions.

4. American families have been changing in various ways over the past 30 to 40 years. Among the changes are:

   --Incomes have increased.

   --Average size has been decreasing.

   --Divorce rates have been increasing.

   --Educational attainment has been increasing for both males and females.

   --Child welfare services have become more extensive.

   --An increasingly greater percentage of women with children have become active in the labor force.

5. Scatter diagrams are useful tools for visually illustrating the degree to which two variables are correlated. A correlation is not a cause and effect relationship. Often one variable is affected by many others, and a scatter diagram is not effective in illustrating the relationships of multiple variables.

Parents Think Families Are In Good Shape

In 1975 and also in 1977 a survey of more than 1,200 families was conducted by the research group of Nankelovich, Skelly and White, Inc. for General Mills. The results of this study were published in the General Mills American Family Report, Raising Children in a Changing Society.

Parents were asked if they thought the country was doing well and if they thought the American family was doing well. Here is how they responded:

	1975	1977
Agree that the country is doing well	18%	60%
Agree that the family is doing well	83%	90%

In 1977, parents were also asked, "If you had it to do again, would you still have children?"

The responses to this question from different groups of parents were:

Parents	Percent Answering Yes
All Parents	90
Fathers	91
Nonworking Mothers	90
Working Mothers	83
Single Parents	73
Minority Parents	72

Of those who would have children again, 9 percent would like to have one child; 41 percent would like to have two children; 45 percent would like to have three or more children, and 5 percent are not sure how many they would like.

Another question had to do with working mothers. Most people, both mothers and fathers, still feel that unless it is necessary for financial reasons, a mother of young children should not work at a job outside the home.

Some of the attitudes of parents regarding issues related to working mothers are summarized on the table below:

Statement	Parents	Percentage Who Agree
Mothers with small children should go to work only if the money is really needed.	Total	82
	Fathers	81
	Mothers	83
	Working Mothers	75
Sometimes mothers must work but children are better off when mothers don't.	Total	69
	Fathers (with working wives)	68
	Fathers (with nonworking wives)	75
	Working Mothers	48
	Nonworking Mothers	73

Parents were also asked to identify social influences which make it hard to raise children. The table below shows some of the influences cited.

Influences	Percentage of Parents Who Cited Each Influence
Drugs	34
Broken marriages	28
Inflation	28
Permissiveness in child raising	27
Crime and violence in the streets	25
Both Parents having to work to get along financially	25
Breakdown of traditional values	22
Decline of religion	18
Parents being more selfish and less willing to sacrifice for their children	17
Insecurity about jobs and unemployment	16
Television	14
Quality of education	14

In summary, the General Mills report indicates that although parents recognize difficulties in maintaining strong families, they believe that the American family is still a "healthy" institution.

Psychiatrist Sees End of American Family

Last week a conference on family relations, Carl Kern, a young psychiatrist, predicted that the American family as we know it will totally disappear by the year 2025. He claimed that a large number of forces are creating what he calls "professional families." Such families are headed by parents who choose to take the responsibility for raising children who were not born to them. Kern believes that fewer and fewer people are capable of carrying out the responsibilities of parenthood. In his address he pointed to the growth in juvenile delinquency, child abuse, drug use, and problems in schools as evidence of the inability of parents to control their children. By the year 2025, Kern claimed, parents will have to be licensed, and the decision about who will raise a child will be made by a panel of experts.

A SAMPLING OF AMERICAN FAMILIES

THE CHANS

In a large three bedroom apartment on the outskirts of Chicago lives the Chan family--David, 52, and June, 48; their three children, Carol, 17, John, 14, and Judy, 13; and David's parents, Peter and Ruth. David works in a downtown bank as a loan officer, and June is a part-time secretary. David and June graduated from the same college. Both David's parents are retired, but neither of them is eligible for social security. Peter does, however, receive a small pension. The total annual income of the Chan family is $27,000 dollars.

THE CARLSONS

Ken Carlson, 42, and his four children--Vicky, 9, Joanne, 7, Paul, 6, and Doug, 4--live in a large four bedroom house in suburban Dallas. Ken, who holds a Masters of Business Administration degree, is vice president of a large chemical company with its offices in Dallas. His annual salary is over 50,000 dollars. Two years ago Ken's wife was killed in an auto accident, and he has not considered remarrying yet.

THE BIG EAGLES

Barry, 38, and Ann, 39, Big Eagle live in Lodge Grass, Montana, with their two children--Bart, 18, and Brian, 15. They own a small house with two bedrooms. After graduating from high school, Barry worked as a farm hand. He now owns a small farm of his own: Ann is a kitchen worker in the local hospital. Their combined annual income is nearly 12,000 dollars.

THE KOWALSKIS

On a large and properous vegetable farm in New Jersey live the Kowalskis. While Karl, 35, the father, farms the land, Lorraine, 33, and their three children--Sara, 6, Sandy, 8, and Roxie, 9--keep their five bedroom house clean, do the cooking, and go to school. Carl never graduated from high school, he only completed the 9th grade and even though his income is about 30,000 dollars, he believes education is very important. Lorraine is currently completing a Master's Degree in social work, and both parents hope that the children will go to college.

THE STERNS

With 3 children and no husband, Barbara Stern, 35, finds it difficult to make ends meet. With only an 11th grade education, she works as a housekeeper at a local hotel, and Steven, her oldest son, works part-time at a gas station. The family's total income is about 6,000 dollars. If they could earn a little more, Barbara thinks they could move out of their cramped one bedroom apartment near downtown Denver.

REAL AVERAGE FAMILY

AMERICAN FAMILIES

STUDENT MATERIALS #3

	Family size	Number of children	Family income	Years of school completed	Size of dwelling	Age of family head	Occupation	Head of household	Other factors
The Chans									
The Carlsons									
The Big Eagles									
The Kowalskis									
The Sterns									
MEAN									
MEDIAN									
MODE									

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REAL AVERAGE FAMILY STUDENT MATERIALS #4

AMERICAN FAMILIES II

U.S. AVERAGES

Major Occupation Group of Employed Family Head (1970)	
Professional, technical, and kindered workers	5 959 421
Managers and administrators, except farm	4 937 445
Sales workers	2 773 689
Clerical and kindered workers	3 433 042
Craftsmen and kindered workers	8 667 755
Operatives, except transport	5 322 803
Transport equipment operatives	2 271 347
Laborers except farm	1 887 785
Farmers and farm managers	1 203 923
Farm Laborers and farm foreman	461 043
Service workers, exc. private household	3 033 140
Private household workers	193 368

Family Size (Mean)		Family Income (Median)	
1970	3.59	1970	$14,958

EDUCATIONAL LEVEL

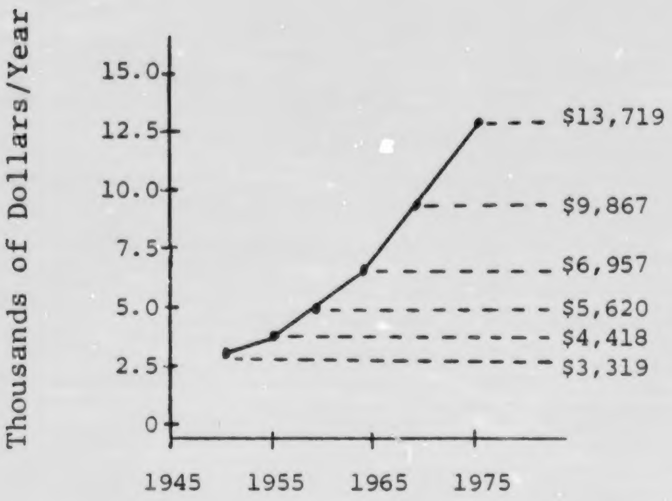
Years of School Completed By Family Head (1970)	No. Of Persons
College	
5 or more	3,184,256
4	3,451,839
1-3	5,760,533
High School	
4	15,112,928
1-3	9,965,728
Elementary	
8	6,206,177
0-7	7,461,401

Median = 12.1

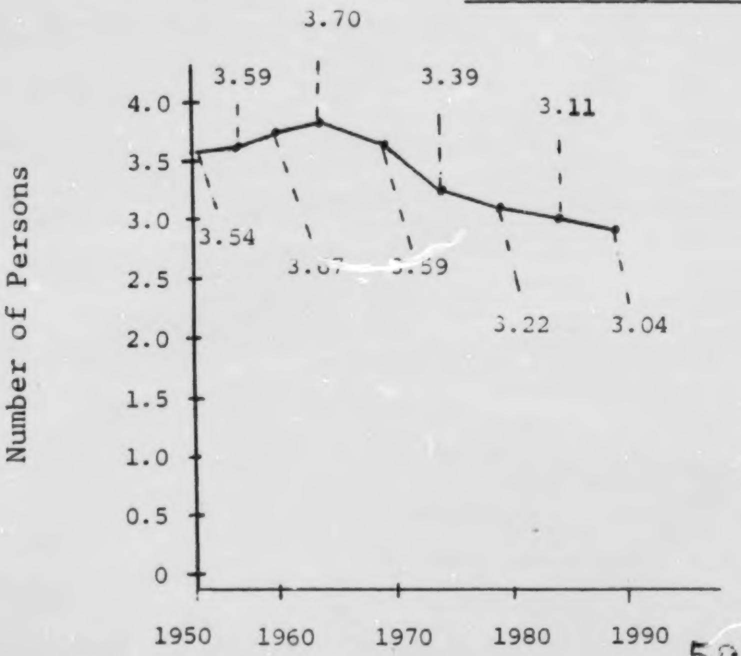
Source: The 1970 U.S. Census of Population and the 1976 edition of the Statistical Abstract of the United States are the sources for these statistics.

FAMILY CHANGES

Median Family Income

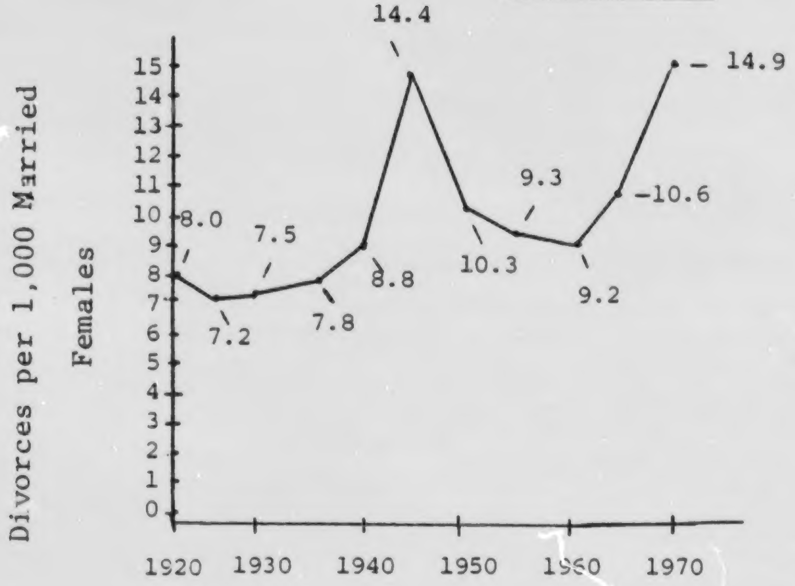


Mean Family Size

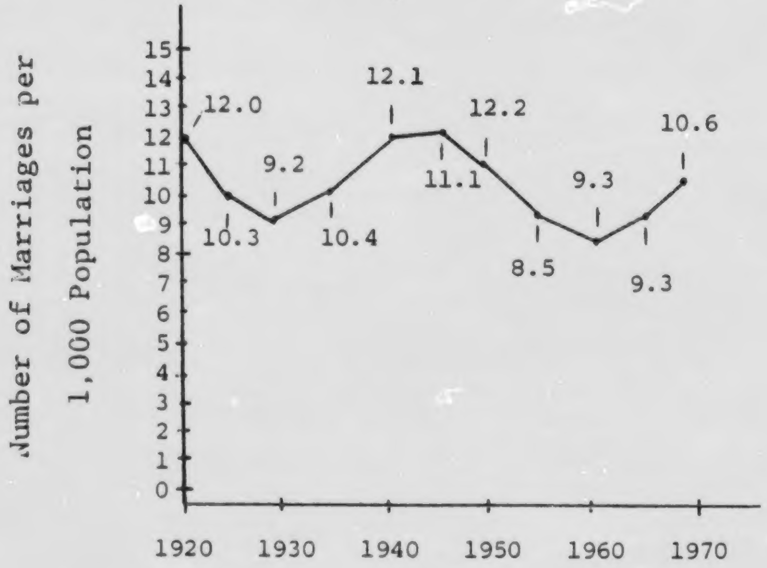


1975-1990 are estimates

Divorce Rate



Marriage Rate



THE FAMILY AND AMERICAN SOCIETY

Years of School Completed

Year	Median School Years Completed Males	Median School Years Completed Females
1970	12.2	12.1
1969	12.1	12.1
1968	12.1	12.1
1967	12.0	12.0
1966	11.8	12.0
1965	11.5	11.8
1962	11.1	11.6
1959	10.7	11.2
1957	10.3	10.9
1950	9.0	9.7
1947	8.9	9.3

Source: The 1976 Bicentennial Edition of Historical Statistics of the United States, Part I is the source of data for these tables. This document is available from the U.S. Department of Commerce, Bureau of the Census.

Child Welfare Services

Year	Children Served Per 10,000 Children Under 21
1970	80
1969	85
1968	80
1967	74
1966	71
1965	67
1964	62
1963	60
1962	56
1961	56
1960	54
1959	49
1958	48
1957	48
1956	46
1955	46
1950	49
1947	50

Family Income

Year	Median Money Income (Dollars)
1970	9,867
1969	9,433
1968	8,633
1967	7,933
1966	7,532
1965	6,957
1964	6,569
1963	6,249
1962	5,956
1961	5,737
1960	5,620
1959	5,417
1958	5,087
1957	4,971
1956	4,783
1955	4,421
1950	3,319
1947	3,031

Married Women (with husbands present) in the Labor Force

Year	% of Women With Children 6-17 Years Only[1]	% of Women With Children Under 6 Years Only[2]
1970	49.2	30.2
1969	48.6	29.3
1968	46.9	27.8
1967	45.0	26.9
1966	43.7	24.0
1965	42.7	23.8
1964	43.0	23.6
1963	41.5	22.4
1962	41.8	21.1
1961	41.7	19.6
1960	39.0	18.2
1959	39.8	18.3
1958	37.6	18.4
1957	36.6	15.9
1956	36.4	15.6
1955	34.7	15.1
1950	28.3	11.2

1. Of all women who have children between 6-17 years, this percentage were employed.
2. Of all women who have children under 6 years, this percentage were employed.

Unemployment

Year	Percent of Civilian Labor Force
1970	4.9
1969	3.5
1968	3.6
1967	3.8
1966	3.8
1965	4.5
1964	5.2
1963	5.7
1962	5.5
1961	6.7
1960	5.5
1959	5.5
1958	6.8
1957	4.3
1956	4.1
1955	4.4
1950	5.3
1947	3.9
1940	14.6

Divorce Rate

Year	Number of Divorces per 1,000 Married Females
1970	14.9
1969	13.4
1968	12.4
1967	11.2
1966	10.9
1965	10.6
1964	10.0
1963	9.6
1962	9.4
1961	9.6
1960	9.2
1959	9.3
1958	8.9
1957	9.2
1956	9.4
1955	9.3
1950	10.3
1947	13.6
1940	8.8

Average Family Size

Year	Average Size
1970	3.58
1969	3.60
1968	3.63
1967	3.67
1966	3.69
1965	3.70
1964	3.70
1963	3.68
1962	3.67
1961	3.70
1960	3.67
1959	3.65
1958	3.64
1957	3.60
1956	3.58
1955	3.59
1950	3.54
1940	3.76

THERE'S A SUCKER BORN EVERY MINUTE

A module for teaching high school
students about advertising with
the aid of quantitative concepts.

Project QUESST

Boulder, Colorado

July, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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1. Advertising Slogans and Companies
2. Advertisements A
3. Sampling in Ads
4. Examples of Potentially Misleading Ads

OVERVIEW OF THE MODULE

Introduction

Everyday we are exposed to a constant flow of advertisements delivered by a variety of media. Many of these inducements use statistics to influence the purchasing public. The T.V. blares that Brand X cures headaches in 43% less time than Brand Y. The radio attempts to convince us that costs at store M are 12% less than at a competitor. Ads in magazines and newspapers bombard us with facts and figures in an effort to persuade us to buy a particular item. This unit teaches students how to evaluate advertisements, and it helps students to identify misleading uses of statistics in advertisements.

Description of Materials

Courses and Topics:

Consumer Issues: Advertising.

Current Social Problems: Advertising and consumer protection.

Sociology: Mass media and manipulation of groups.

Grade Level: 10-12.

Time Required: Two-three class periods.

Concepts and Skills:

Social Studies Concepts: Mass advertising and representative sample.

Quantitative Concepts: Percentage and limits of statistics (proper and improper usages).

Thinking Skills: Interpreting, generalizing, analyzing, and hypothesizing.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Explain that advertising can be a useful source of information, but there are also numerous deceptive advertising practices.
2. Identify several deceptive uses of statistics in advertising.
3. Explain the importance of sample size and representativeness in reliable uses of statistics.
4. Recognize the importance of and be sensitized to the role of advertising in their lives.

Sources of Data:

Hypothetical advertisements developed for this module. The ads are based on actual advertisements prevalent in the daily media.

LESSON 1: ADS IN OUR LIVES

Introducing the Lesson

1. Ask students:

   --How much attention do you devote to advertisements? They will probably say not much.

2. Distribute copies of Advertising Slogans and Companies (Student Materials #1) to students and have them match the slogans with the product. Discuss answers (Teacher Supplement #1). Ask how many students missed 1 question, 2 questions, 3 questions, 4 questions, 5 questions, more than 5 questions. Record answers on the board.

   Then ask students to explain how they were able to identify so many slogans correctly when they don't pay attention to advertisements. The object of this question is to make students realize that they are constantly bombarded with advertisements, and this stream of data has an influence upon them, even if they are unaware of the influence.

Developing the Lesson

3. Have students examine the three advertisements in Advertisements A (Student Materials #2) and discuss the following questions:

   --What is the purpose of the Bayer Aspirin advertisement? To convince people to buy Bayer Aspirin.

   --What is the purpose of the Burnzumup advertisement? To convince people to purchase Burnzumup microwave ovens.

   --What is the purpose of the Kumquat General advertisement? To convince people to enroll in Kumquat General's dental insurance plan.

--Based upon the evidence from these three advertisements, what hypothesis might you formulate about a purpose of advertisements in general? Ads are designed to induce people to purchase particular products.

--Can you think of any additional purposes that ads serve? Consider some social, economic, and personal benefits of advertising. Examples might be: They help society to be more homogeneous by making most people aware of the same products and life styles. They help to maintain employment for people working in advertising. They provide information about products to people who need to buy an item.

NOTE: Although the three sample advertisements all focused upon selling items, there are other purposes for ads. For example, the American Lung Association uses advertisements to try to convince people to change their behavior, to stop smoking, and to support the Association through donations.

--What are some techniques that advertisements use to convince people to buy a product? Possible answers are: try to prove a product's superiority or popularity, suggest that users may gain qualities possessed by a respected personality, or show that the product fulfills a pressing need.

--Why might medical ads use a doctor to present the evidence about a product, while an olympic hero might be in ads for sporting goods? The audience might trust these people because they are supposedly "experts" in their field.

--Why might an athlete be used to advertise coffee makers? Many people respect, trust, and admire athletes. Consumers may reason that if the product is good enough for a famous individual, it must be good enough for an ordinary person. There may also be an element of trying to identify with the famous personality. If a tennis star and I use the same coffee maker, I have something in common with the star.

--Can you find examples of techniques used in advertising to convince people to buy a particular product?

4. Assign students for homework to look for additional evidence to support their hypothesis that ads try to convince people to buy items.

5. A major function of advertising, to induce people to purchase a particular item, may build a bias into advertisements. Although many ads are accurate and provide valuable information, some advertisements may be potentially misleading or worse. Because the writers of ads want people to purchase particular items, they may attempt to use techniques which make those items seem highly attractive. Some exercise only focuses upon deceptive uses of statistics in advertising. Examine the ad for Bayer aspirin (Student Materials #2) and consider the following questions:

How reliable do you think the ad would be if:

--The recommendations came from two doctors who work for Bayer? It may or may not be reliable because these doctors may have an interest in selling more Bayer Aspirins.

--The doctors only had a choice between prescribing aspirin or sugar pills? It may not be very reliable because most doctors would probably choose a medicine over a sugar pill. This says nothing about how Bayer Aspirin compares with other medicine.

--The only doctors asked were ones who received free samples from Bayer? It might not be very reliable because these doctors might be afraid that they wouldn't receive free supplies if they gave a non-supportive answer.

--You discovered that doctors recommended Bayer because it was cheaper, more available, tasted better, or was easier to swallow? These criteria are not based upon the effectiveness of the drug, although they may be important considerations for some individuals. They say nothing about the actual effectiveness of Bayer Aspirin.

--Based upon your response to these questions, what is some information which you need to know about groups making testimonials in support of products? Most students will probably request data about the composition of the group making the testimonial. For example, students might want to know about who the people were in the testimonial group, what were their relationships with the advertising company, what choices of other products they had, whether they were paid for the testimonial, or what were their reasons for choosing this particular product. That is, students are raising questions about sampling.

There are a variety of reasons for using sampling techniques. Among the reasons for sampling are: (1) decreased cost, (2) reduced number of people required for collecting data, (3) may be done quickly, (4) helps to obtain data that may not otherwise be available, and (5) helps to obtain more comprehensive data.

An example of using sampling to obtain data that would otherise not be available is the manufacturer of firecrackers who tests one in every fifty firecrackers to insure that they will explode.

--What would happen to the profits of a firecracker manufacturer if he or she tested every one of these products?

6. After students have completed describing what they would like to know about groups supporting products in ads, indicate that most of the issues which they mentioned are related to sampling techniques. Ask:
--How might you define sampling?

Students should indicate that a sample is a small, but typical part of a larger entity.

NOTE: If they cannot define the term in the abstract the teacher may offer the example of an old west miner who would take a sample of ore to an essay office to have its gold content analyzed. In this case, a sample means a small piece of ore taken from a larger piece of ore.

7. Once students define sample, ask:

--What is meant by a representative sample? A sample that is smaller than the total population, but has the same characteristics as the larger population.

--What would you have to consider if you wanted a representative sample of the United States population? Race, sex, age, education, income, geographical location, ethnicity, rural or urban, married or single, number of children, and occupation are possible answers.

--Can you identify any products or services which might receive different evaluations by different groups within the general population? For example, how might an evaluation of a large station wagon by a 17-year-old male Corvette owner differ from one by a 40-year-old father of eight?

--What are some methods that one could use to get representative samples? Interview the people in every tenth house along all of the streets in town. Identify what percent of the population is over 65 years of age, between 65 and 30, between 30 and 18, under 18, and interview a total of 100 people but interview a percentage of people in each age group that is the same as their percentage in the society as a whole.

There are a variety of sampling techniques. Random and stratified sampling are two commonly used techniques. A random sample is one in which every individual in the total population has an equal chance of being selected for the sample. However, random sampling techniques can produce samples which are not representative of the total population. Suppose that you have a box with 6 1/2-inch bolts, 6 3/8-inch bolts, and 6 1/4-inch bolts. Ideally, a 1/3 sample of your box of bolts would produce 2 bolts of each size. However, it is possible that simply reaching into the box and taking out 6 bolts could produce a sample that only contained all of the bolts of one size. To reduce the possibility of obtaining such unrepresentative samples, samplers often use stratified samples. When this technique is used, the total population is divided into categories. Samples are then taken from each category and these samples reflect the percentage of the category in the total population. For example, we could divide our bolts into three categories, 1/2-inch, 3/8-inch, and 1/4-inch. Since each category is 1/3 of the total population, 1/3 of our sample must come from each category. If our sample size includes six bolts, two bolts should be taken from each category.

8. Sample size is often related to the issues of representativeness. Particularly if it is a random sample, the smaller the sample size the greater the probability that it is non-representative. For example, in the Bayer ad (Student Materials #2),

--Which would be more reliable, a sample of two doctors, or a sample of 300,000 doctors in the country? 300,000. Why? Because the smaller sample may less accurately reflect the views of most doctors.

A variation of this issue appears in ads that deal with percentages and ratios. For example, "50% of the people interviewed said. . ." or "9 out of 10 doctors. . ." Another deceptive practice may be to interview 100 sets of 10 people each, but to report only the responses from the most favorable one or two sets.

9. Remembering these potentially misleading uses of statistics, have students examine the ads in Sampling in Ads (Student Materials #3). Ask:

--What would you want to know, if anything, about each ad before deciding if it was accurate or not? Who was in the sample? How were samples determined?

--Why would you want to know that? To determine if the samples are representative.

--Why might the ad be misleading if you don't know that? The ads could reflect biases. The samples may not reflect the opinions of a representative sample of the U.S. population.

Another potentially misleading practice similar to poor sampling is the use of atypical people in ads.

--What is the profession of most people who appear in ads? Most people who appear in ads are paid, professional actors or models.

--Physically how do most compare with average citizens? Usually they are more attractive.

--Why are attractive people used as models in most ads? Other people may be attracted by the good looks of the model or feel that the product may make them as attractive as the actor or model.

--Can you describe any examples of ads that use attractive models to sell a product?

NOTE: It important to stress that the ads may, in fact, be quite accurate. Sometimes, when we get additional information it becomes clear that the ads were accurate, and there was no attempt to mislead the public. However, many times, until we get additional data the best that can be said about some ads is that one does not know if they are true or not.

Concluding the Lesson

10. Inappropriate sampling is only one set of deceptive practices used in advertising. Although many ads provide accurate and valuable information, others use potentially misleading techniques. One way to identify potentially misleading ads is to question the meaning of each word. If a word does not say anything, beware. Examples are fast, better, longer, and cleaner. Discuss each of the six examples below. Can you think of any examples of these practices in real ads?

--Weasel word--Words which are meaningless. Only zippos give you the zippo taste.

--False authority--Using an actor to project a false image of authority--an actor in a lab coat advertising a medicine. People assume the actor is a doctor.

--Vague terms--Words or terms with unclear meaning--for fast relief take creepo's. Fast compared to what?

--Visual substitutes--Replacing one product with another that looks better. Shaving cream holds up better than whipping cream, so it is used in many ads and lasts longer.

--Meaningless demonstrations--Demonstrations which say little about a product. For a clean wash use tearzzumup. Mrs. Johns found it was the best detergent she ever used. What they don't show is that they used an entire box to do her wash.

--Ads by prominent personalities--Using famous people to endorse a product--Reggie Jackson shaves with Whiskum. Why should Reggie Jackson know any more about shaving than Joe Whiskers down at the end of the block?

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

This module focuses upon the misuse of sampling in advertising. By presenting students with a variety of potentially deceptive ads, the module assists students to explore how ads may be misleading. One primary consideration is the sampling techniques used by advertisers. Students explore random and stratified sampling and the problems posed by the failure to use these techniques in advertising testimonials. Finally, the module presents a variety of additional deceptive advertising practices. Students use their knowledge of deceptive practices to analyze such as vague or meaningless words, false authorities, visual substitutes, weasel words, meaningless demonstrations, endorsements by prominent personalities , and a variety of current ads.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lesson of the module.

1. Have students conduct a one-day course in deceptive advertising for other students in the school. Include both potentially misleading uses of statistics and other potentially misleading advertising techniques. If used with younger children, this course might focus upon ads aired during childrens' television programs.

2. Conduct a field trip to an advertising agency or have a representative come to class. In either case, have students prepare specific questions they desire to have answered and share these with the visitor beforehand. The class might consider asking:

   --How do you identify samples for market research?

   --What are some factors you look for in writing a good advertisement?

   --What are techniques you use to convince potential buyers to purchase a product?

3. Identify some ads that are potentially misleading, i.e., ads that report data from samples without describing the sampling techniques used. Write to the companies involved and ask for the data that would allow you to decide if the ads were misleading or not. Keep a record of what percentage of ads were misleading and what percentage were valid. You might also keep a record of which companies furnish the requested information.

SUPPLEMENTARY TEACHER
MATERIALS #1
(Answer Sheet)

ADVERTISING SLOGANS & COMPANIES

1. McDonalds (d)
2. Kentucky Fried Chicken (a)
3. Toyota (c)
4. Alka Seltzer (e)
5. Rolaids (b)
6. Miller (i)
7. Schlitz (h)
8. Datson (n)
9. Prudential (f)
10. United Airlines (j)
11. Greyhound (m)
12. Hertz (k)
13. Avis (g)
14. Yellow Pages (l)

ADVERTISING SLOGANS AND COMPANIES

MATCH SLOGANS AND COMPANIES

____1.	We do it all for you.	(a)	Kentucky Fried Chicken
____2.	Finger lickin' good.	(b)	Rolaids
____3.	You asked for it you got it.	(c)	Toyota
____4.	Plop, Plop, Fizz, Fizz, Oh what a relief it is.	(d)	McDonalds
____5.	How do you spell relief?	(e)	Alka Seltzer
____6.	If you've got the time, we've got the beer.	(f)	Prudential Insurance
____7.	You only go around once in life. Grab all the gusto you can get.	(g)	Avis
____8.	We are driven.	(h)	Schlitz
____9.	Get a piece of the rock.	(i)	Miller
____10.	Fly the friendly skies.	(j)	United Airlines
____11.	Leave the driving to us.	(k)	Hertz
____12.	The superstar in rent-a-car.	(l)	Yellow Pages
____13.	We try harder.	(m)	Greyhound Bus Lines
____14.	Let your fingers do the walking.	(n)	Datsun

ADVERTISEMENTS A

"DOCTORS RECOMMEND ASPIRIN
MORE THAN TWO TO ONE OVER
ANY OTHER MEDICATION."

*-from an advertisement
for aspirin that appeared
on television often.*

Quality is No. 1 at BURNZUMUP

76% of the independent microwave oven service technicians surveyed recommend BURNZUMUP. BURNZUMUP leads all brands.

PREFERENCE FOR SPECIFIC BRANDS AMONG TECHNICIANS SERVICING THOSE BRANDS				AVERAGE PREFERENCE FOR BURNZUMUP VS. ALL COMPETITION— (weighted average)
Brand to Brand	BURNZUMUP *vs.* X	BURNZUMUP *vs.* M	BURNZUMUP *vs.* Z	
Which Microwave Oven Brand would you recommend to a friend?	60% *vs.* 40%	65% *vs.* 15%	85% *vs.* 1%	78% *vs.* 6%
Which Microwave Oven Brand is easiest to repair?	[illegible]0% *vs.* 6%	75% *vs.* 10%	81% *vs.* 0%	78% *vs.* 14%
Which Microwave Oven Brand is the best quality?	50% *vs.* 10%	60% *vs.* 10%	70% *vs.* 1%	68% *vs.* 9%
Which Microwave Oven Brand requires fewest repairs?	28% *vs.* 12%	52% *vs.* 14%	60% *vs.* 3%	58% *vs.* 12%
Which Microwave Oven Brand do you have in your home?	58% *vs.* 16%	60% *vs.* 13%	75% *vs.* 2%	65% *vs.* 80%

Among independent technicians servicing BURNZUMUP and competitive microwave ovens, an average of 76% of those surveyed said they would recommend BURNZUMUP to a friend. And an average of 63% identified BURNZUMUP brand ovens as having the best quality.

BURNZUMUP...changing the way the world cooks.

ADVERTISEMENTS A

Now there's evidence.

Kumquat General's performance in group dental insurance cited by dentists in recent independent survey*

If you're concerned with your company's group dental insurance, you owe it to yourself to look at these figures. They're the recent findings of a survey of dentists conducted by an independent association.

INSURANCE CARRIERS	GOOD[2]	FAIR[3]	POOR[4]
Kumquat General Insurance Co.	93.0	5.9	1.1
Bee Bop Life Insurance Co.	79.2	19.0	9.8
Morbid Medical Indemnity Plan	55.5	39.2	5.0
Honest John Mutual Life Insurance Co.	53.0	31.4	15.6
White Cross/White Shield of Centralville	40.9	38.3	20.8
Bite Rite Dental Plan of Michigan	20.9	50.0	29.1
Zenia Life and Casuality	21.3	48.5	30.2

One of the things the association wanted to know was how well a number of group dental insurance companies were performing.

So, they surveyed almost 2,000[1] dentists serving a giant industry dental program in four Midwestern states: Michigan, Indiana, Missouri, and Ohio.

This is what the survey asked:

"Please evaluate the general performance of the (insurance) carriers you deal with..."

These were the results:

Ninety-three percent of the dentists who rated Kumquat General felt our performance was good. Clearly, this is a vital survey tool for anyone responsible for their company's group dental insurance program. After all, you want a group dental program without grief and hassle for you and your employees.

*Source: American Dental Association, 1976.

[1] 44.4% of this total replied.

[2] Good—Usually prompt, courteous, problem-free.

[3] Fair—Some problems but not chronic.

[4] Poor—Frequent problems.

SAMPLING IN ADS

By the early 1970's, most smokers had tried a low tar cigarette. Yet eight out of ten had rejected them.

Despite all the promises of "low tar, good taste" most of the cigarettes just didn't deliver.

It looked like no low tar cigarette would ever break the mold.

August, 1975
Tests Prove New BURNOUT Delivers Taste of Cigarettes Having Up To 60% More Tar.

BURNOUT was tested against a number of higher tar cigarettes with thousands of smokers in the country.

The results showed:

BURNOUT was reported by a majority of smokers tested to deliver as much—or more—taste than cigarettes having up to 60% more tar!

Smokers weren't interested in BURNOUT success. They were interested in—and excited about— BURNOUT taste. So much so, that a lot of unsolicited smoker mail came in supporting BURNOUT.

"After smoking one pack, I was really surprised...they were as good as any cigarettes with more tar."

John Lungless
Cancer Corner, Oh.

> Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.

"BURNOUT cigarettes have changed me from a high tar cigarette smoker to a BURNOUT smoker."

Mr. T. B. Ward
Los Angeles, CA

In tests against a number of major 100 mm brands ranging from 17 mg to 19 mg tar, smokers reported that, overall, they liked the taste of new 12 mg tar BURNOUT 100's as much as the brands with more tar.

December, 1977
75% Of All BURNOUT Smokers Coming From High Tar Brands.

High tar smoking? What seemed impossible to consider once, may not seem so remote today.

According to a recent survey, BURNOUT smokers have changed directly from a brand with more tar.

The toughest taste "critics" of low tar smoking are switching to—and sticking with—BURNOUT.

With the technology, the test results, and now this kind of response from high tar smokers, there's little doubt.

BURNOUT is the first major alternative to high tar smoking.

And you can taste it.

BURNOUT

Kings & 100's

SAMPLING IN ADS

Of all light beers

RED EYE

Is the lowest

See how RED EYE BEER compares in calories with ten popular beers:

RED EYE	110 Cal.
Suds	190 Cal.
Suds Light	160 Cal.
Burpee	185 Cal.
Shlosh O	175 Cal.
Old Alky	190 Cal.
Old Alky Light	140 Cal.
Binge	180 Cal.
Red Nose Special	190 Cal.
Guzzle	145 Cal.
Lights Out	130 Cal.

SAMPLING IN ADS

Major low tar brands tested!

CANCER STIX

voted best low tar cigarette!

Best taste—

Most satisfaction—

Richest Flavor—

Now you know.

The National Test.

Regular king-size filter smokers—both full-flavor and low-tar smokers—tested CANCER STIX Filter and major non-menthol low tar brands. Each person smoked one low tar brand on an unidentified basis and rated it. CANCER STIX Filter was rated higher overall than every low tar brand tested. It was rated higher on taste, satisfaction, natural taste, and rich flavor. Yet CANCER STIX has only 9 mg. tar.

Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.

The natural cigarette.
Nothing artificial added.

EXAMPLES OF POTENTIALLY DECEPTIVE ADVERTISEMENTS

The following assignment asks you to find examples of six types of potentially misleading advertisements. Underneath each type of ad and its example, you will list a real example of that type of ad which you have found, the location where you found it, and a brief explanation of why you think that ad is an example of the type. Magazines, television, radio, and newspapers are good sources for finding examples.

1. WEASEL WORDS -- Only Zippos give you the Zippo taste.

   Real example of a weasel word ad.

   Location.

   Explanation of why it's a weasel word ad.

2. FALSE AUTHORITY -- An actor in a lab coat advertising medicine.

   Real example of a false authority ad.

   Location.

   Explanation of why it's a false authority ad.

3. VAGUE TERMS -- For fast relief take Creepos. (Fast compared to what?)

   Real example of a vague term ad.

   Location.

   Explanation of why it's a vague term ad.

4. VISUAL SUBSTITUTE -- Shaving cream looks better than whipping cream, so it is used in many whipping cream ads.

Real example of a visual substitute (You probably can't identify these easily. So you may have to identify ads which MIGHT use visual substitutes.)

Location.

Explanation of why it may be a visual substitute.

5. MEANINGLESS DEMONSTRATIONS -- For a clean wash use Tearsumup. Ms. Johns found it was the best detergent that she'd ever used. (What they didn't show was that it took an entire box and three days of soaking to do her wash.)

Real example of a meaningless demonstration.

Location

Explanation of why it's an example of a meaningless demonstration.

6. ADS BY PROMINENT PERSONALITIES -- Reggie Jackson shaves with Whiskum.(Why should Reggie Jackson know more about shaving than Joe Whiskers who lives at the end of the block?)

Real example of ads by prominent personalities.

Location.

Explanation of why it's an example of an ad by a prominent personality.

7. POTENTIALLY MISLEADING SAMPLING -- 4 out of 5 housewives use scrubbos for a cleaner wash.

Real example of an ad with potentially misleading sampling.

Location.

Explanation of why it's an example of an ad with potentially misleading samples.

BUT HOW DO I KNOW WHICH ONE TO BUY?

A module for teaching high school students
consumer decision-making with the aid of
quantitative concepts.

Project QUESST
Boulder, Colorado
July, 1979

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This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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1. Reading Tables (Answer Sheet)

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1. Joe's Decision
2. Joe's Criteria for a Car, Rank Ordered by Importance
3. A Consumer Decision-Making Model
4. Using Tables to Help Reach a Decision About Buying a Car

OVERVIEW OF THE MODULE

Introduction

Should I buy brand A or B? One is cheaper, but is it really a better buy? How can I make my dollar stretch farther in these days of inflation? How do I know what to buy and where I can get the information I need to make a purchasing decision? As consumers, each of us face these types of questions. Millions of dollars each year are wasted through poor purchases. This module helps students to become wise consumers by presenting them with a decision-making model which they can use whenever they have to make a purchase. By employing the concepts of priorities, rank ordering, trade offs, tables,and continuums, this module assists students to develop skills of comparing, interpreting, and evaluating.

Description of Materials

Courses and Topics:

Consumer Issues: Purchasing and consumer decision-making.

Economics. Consumer economics.

Grade Level: 10-12.

Time Required: Two class periods.

Concepts and Skills:

Social Studies Concepts: Decision-making, priorities, and consumer goods.

Quantitative Concepts: Trade offs, tables, and rank order.

Thinking Skills: Comparing, interpreting, and evaluating.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Describe and rank order the criteria they use when purchasing goods.
2. Employ a nine-step decision-making model before making purchasing decisions.
3. Use tables, percentages, rank order lists, and continuums when making consumer decisions.
4. Explain that consumer decisions often involve trade-offs.
5. Identify two sources of consumer information.

Sources of Data:

The 1978 Gas Mileage Guide was the source of data for automobile mileage. The Guide is published yearly by the U.S. Department of Energy. The Cost of Owning and Operating an Automobile 1976 provided data about operating expenses for automobiles. This document is published by the U.S. Department of Transportation. The 1978 Consumer Report Buying Guide provided the data about dealer service. U.S. Department of Energy, 1978 Gas Mileage Guide, (Washington, D.C.: U.S. Government Printing Office: 1977 0-245-138, 1977). U.S. Department of Transportation, Cost of Owning and Operating an Automobile, 1976 (Washinton, D.C.: U.S. Department of Transportation, 1976).

LESSON 1: A DECISION-MAKING MODEL FOR CONSUMERS

Introducing the Lesson

1. Ask students to list all of the things which they have purchased in the last month. After students complete the list, ask them to select one or two items and to describe how they decided to buy that particular item. What did students consider before making their purchase? Most students will probably describe purchasing procedures which are not systematic. List the procedures on the board. Ask students:

   --Do you think that you would make better purchases, get better quality goods, buy at a lower price, or get better service if you used a more systematic approach to purchasing? Most students will answer yes.

   Explain to students that the following activities are designed to help them to be better consumers. It will provide them with a decision-making model which they can use when purchasing anything. We all spend money, and we all want to get the best possible product at the best possible price.

2. Distribute copies of "Joe's Choices" (Student Materials #1), and allow students to complete the exercise. Ask students which vehicle they would choose as the best one for Joe. List their choices on the chalkboard under A, B, C, or D.

3. After you have recorded the student selections, ask students:

   --What are your reasons for selecting a particular vehicle? Part of this discussion should focus upon the fact that different students used different criterion for selecting an automobile.

4. Distribute "Joe's Criteria for a Car" (Student Materials #2) and compare Joe's rank order of criteria with the criteria students identified as important. You should explore the idea that there is not a "best" product for everyone because each of us has different needs, wants, and expectations of a product. Discuss the difference between quantitative and qualitative data and ask students to provide examples of both types.

Also discuss the list of sources of information in the Student Materials focusing upon the strengths and weaknesses of each source.

Quantitative data is information which can be described by using numbers. For example, horsepower is a quantitative item.

Qualitative data, on the other hand, is difficult or impossible to describe numerically. For example, dealer reputation is difficult to describe by using numbers.

Trade offs refers to the process of sacrificing one goal to gain another. For example, a customer may have to sacrifice acceleration and speed to gain economical gas mileage.

Developing the Lesson

5. Distribute copies of "A Consumer Decision-Making Model" (Student Materials #3). Allow students to read it and answer the questions it contains. Then, discuss student answers and the steps in the model. Have students reconsider their choice for Joe.

   --Would your choice change if you had used this decision-making model?

   --If so, how would it change and why?

   --How did your criteria compare with Joe's?

6. Distribute Student Materials #4 and explain that at one time or another most Americans purchase an automobile. Before students can actually apply the decision-making model, they must be able to read a table accurately and use the data contained in that table. Therefore, have students complete the first section of Student Materials #4, Reading a Table. Discuss the answers in order to be certain that each student can read a table effectively. An answer sheet is provided in Supplementary Teacher Materials #1. Tell students that they will now have an opportunity to use the decision-making model. Ask students to identify one item (e.g., car, stereo) which they would like to buy in the near future.

NOTE: Check the items they select in order to be certain that the items are important enough that students can locate consumer oriented data about them. If students cannot identify an item which they would like to buy in the near future, ask them to assume that they will be buying an automobile. Have all students proceed through the decision-making model, beginning with step 2, if they are not purchasing an automobile. Students purchasing an automobile will start with step 4 of the model since they have already completed steps 1, 2, and 3.

Concluding the Lesson

7. Have students share their purchase choices with the class. Examine the reasons supporting their choices.

--Would any additional information be useful before making their decision? Possible responses are: for a car, insurance rates for specific vehicles and repair rates.

8. Compare the way you make most consumer decisions with the decisions made by using the model.

NOTE: This could be a small group activity.

--Which process do you think will produce more satisfactory buying? Using the decision-making model.

--What are the advantages and limitations of each approach? The decision-making model takes time and it may be difficult to gather all of the desired data, but it should produce more rational choices. Other procedures may be quicker but produce more costly and less satisfactory consumer choices.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

These major points are:

1. Consumer decision-making should be a rational process which follows a decision-making model. One model includes the following steps:
    - a. Identify need or desire for a product.
    - b. Identify desirable characteristics of the needed product.
    - c. Rank order the desirable characteristics.
    - d. Identify brands and dealers of the product.
    - e. Collect data about each brand and dealer.
    - f. Compare this data with your rank-ordered list.
    - g. Consider the trade offs involved.
    - h. Decide which brand and dealer best meets your needs.
    - i. Purchase the item.
2. There are numerous sources of data which should be consulted. Government publications, especially those from the Consumer Information Center, Pueblo, Colorado 81009, data from manufacturers, and publications from consumer protection groups are particularly valuable.
3. Tables and charts are useful sources of information because they summarize a great deal of data quickly.
4. Some data are quantitative while others are qualitative. Quantitative data presents information numerically while qualitative data is not presented numerically. Both types of data have advantages and disadvantages.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Have students ask parents, friends, or customers in a store how they decide to buy the particular brands which they purchase. Some questions which students might ask are:

   a. What factors determine which brand of this item you buy?

   b. Did you compare several brands?

   c. Did you look in Consumer Report or obtain data from other sources about the product you are considering buying?

   d. For large items, did you visit several dealers before making a purchase?

   Evaluate and discuss the purchasing process. Do most people seem to use a logical purchasing process or not?

2. Have a group of students teach another group of students the decision-making model.

3. Have someone from a local consumer group present the class with strategies for wise consumer buying.

SUPPLEMENTAL MATERIALS

1. Educational and Consumer Relations Department of the J. C. Penney Co., Inc., Dynamic Decision Making (New York: J. C. Penney Co., Inc., 1972).

2. Melinda E. Blau under the direction of Ralph Nader, To Buy or Not to Buy (New York: Random House, Inc., 1975).

Reading Tables

Answers to the questions in Student Materials #4.

1. Cost of gasoline per gallon	
2. $328	15,000 ÷ 32 = 468.75 x $.90 = $422
3. $112 more	15,000 ÷ 20 = 750 x $.85 = $638.
	15,000 ÷ 20 = 750 x $1 = $750.
	$750 - $638 = $112.
4. $319 saved	15,000 ÷ 20 = 750 x $.90 = $675.
	15,000 ÷ 38 = 395 x $.90 = $356.
	$675 - $356 = $319.
5. $210 and $330	15,000 ÷ 50 = 300 x $.80 = $240
	15,000 ÷ 50 = 300 x $1.10 = $330.
6. $525 and $825	15,000 ÷ 20 = 750 x $.90 = $ 675
	15,000 ÷ 20 = 750 x $1.10 = $825.

7. The lower the gas mileage of a car, the more the cars owner will pay as gas prices increase.

JOE'S DECISION

Joe Hernandez just got a job as a t.v. repairman, but he doesn't have any way to get to work or to transport all of the tools he will need. In addition, he doesn't have very much money, although with a good job he can now get a bank loan to buy a car. Joe figures that $5600 is the most that he can spend for a car. He narrowed his choices to the four vehicles described in the table below. Which one would you buy if you were Joe and why would you buy that one?

Criteria Sheet

	CAR	A	B	C	D
1.	Initial Cost	$3900	$4100	$5500	$2300
2.	Gas mileage	18mpg*	15mpg	15mpg	25mpg
3.	Rate of repairs needed by car**	average	better than average	average	worse than average
4.	Distance of Dealer	5 miles	2 miles	1 mile	18 miles
5.	Dealer Reputation	average	below average	good	poor
6.	Comfort of Ride	fair	good	excellent	fair
7.	Rate of acceleration (0-60) mph***	18 secs.	20 secs.	14 secs.	23 secs.
8.	Trunk size	6 Cu.Ft.	8 Cu.Ft.	12 Cu.Ft.	6.5 Cu.Ft.

---

*mpg--miles per gallon.

**refers to how often a model of car needed to be repaired, based on car owner reports.

***mph--miles per hour.

1. I think Joe should choose car ________ because: ________

    ____

    ____

    ____

    ____

2. If I were going to buy a car, I would want a car that (list as many reasons as you can):

    ____

    ____

    ____

    ____

3. How would the car you might buy differ from Joe's car?

    ____

    ____

    ____

    ____

4. Why would your car differ from Joe's? ________________

    ____

    ____

    ____

    ____

JOE'S CRITERIA FOR A CAR RANK ORDERED BY IMPORTANCE

1. Low initial cost to purchase car
2. Good gas mileage
3. A low rate and cost of repairs
4. Adequate trunk size for carrying boxes and work tools
5. A reliable and fair repair shop that isn't too far away
6. A dealer with a good reputation for being fair
7. A quiet car which rides smoothly and handles well
8. A good rate of acceleration

Obviously, someone else buying an automobile would probably have a different set of criteria and different priorities. That's why it is important that everyone consider what they think is important about an object before they buy it. The characteristics that you might want in an automobile may not interest your best friend at all. Make a list of the characteristics you want in an automobile.

Notice that some of Joe's criteria can be measured easily. That is, one can find figures to describe the initial cost, gas mileage, distance to repair shop, rate of acceleration, and trunk size. Data which is based upon numerical measurements is called quantitative data. However, other characteristics such as dealer reputation or degree of comfort are more difficult to measure. These types of descriptions rarely use numbers. Therefore, they are referred to as qualitative data. Sometimes both types of data can be placed on a continuum. For example, car repair rates are reported: much worse than average, worse than average, better than average, much better than average. What items on your list of desirable characteristics for a car can be measured easily? List these together. Where can you find quantitative data to describe various brands of automobiles? At the end of this reading is a list of possible sources of information for consumers. These sources are very useful for providing information about many items which you might want to purchase. Some of the data they present is quantitative, while other data is qualitative. If the automobile which you might buy is like most products, some brands score well in some areas and low in others. Often, no single brand has a high score in everything you wanted. Therefore, you find yourself faced with a trade-off. To get an item with high scores in high priority areas, you may have to accept low scores in low priority areas. That is, to gain one characteristic, you may have to sacrifice another.

SOURCES OF PURCHASING INFORMATION

1. Consumer Reports
2. Consumers Digest
3. Consumers Bulletin
4. Consumer Guide
5. Various government publications in a wide variety of areas especially from the Consumer Information Center, Pueblo, Colorado 81004.
6. Manufacturers warranties
7. Local consumer protection agencies
8. Advertisements for products
9. Sales people
10. Information plates and tags attached to products

A CONSUMER DECISION-MAKING MODEL

List some items which you or your family would like to buy in the near future. For each item, list the types of information you consider before buying that type of object. Why might you decide to buy Brand X instead of Brand Y or Brand W? One of the things that may influence your decision is your value system. Values are the things that you believe so strongly that they influence the way you act. Sometimes values lead us to make decisions that some things are more important than others. Things that have the most importance have a high priority, while things with less importance have a low priority. When wise consumers buy items they often have a list of criteria of what they want an item to be like. Some of these criteria are more important than others. That is, they have a higher priority. Select one item from your list of possible purchases. Review your list of all the important criteria that you would consider before you buy that article. Can you add any additional criteria? Rank order those criteria from the most important (highest priority) to least important (lowest priority). If you plotted these criteria along a line with end points of most and least important, your rank order could be called a continuum. Usually you are willing to trade off low priority items to get high priority items. Next, you would continue through the steps in the model below, starting with Step 4. (You have already done 1-3.)

The steps in the model are:

1. Identify need. Do I need or desire this item?
2. Identify important characteristics of a good product of this type.
3. Rank order these characteristics from most important to least important for you.
4. Identify brands and dealers of the product you are considering buying.
5. Collect data about each brand and local dealer.
6. Compare this data with your rank-ordered characteristics.

7. Consider trade-offs among characteristics.
8. Decide which brand and dealer best fits your needs.
9. Purchase the most desirable item from the most desirable dealer.

USING TABLES TO HELP REACH A DECISION ABOUT BUYING A CAR

Listed below are some questions to guide you in looking at the information included in Tables A, B, C, and D. Remember these points about reading tables as you answer the questions:

1. Title. A good title should state precisely what information is contained in the table. A title such as "Fuel cost, in dollars, per 15,000 mile" is, therefore, more helpful that a title such as "Fuel Costs."

2. Source. Every table should identify its source of information. "Is the source reliable?" is a question that should always be asked. Does the source report how and when the data presented in the table was gathered? If we don't know how and when data was collected then it may be difficult to judge how reliable the data is.

3. Footnotes. Footnotes supply additional information which you may need to know to read the table accurately.

4. Column and Row Headings. The headings provide additional detail on the type of information presented in the table. In Table B the headings clearly show that the costs are reported for each 5¢ increase in the cost of gasoline.

5. Units of Measure. Tables are often misread because people do not identify the kind of information being reported. In Table B the unit of measure is dollars.

6. Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending upon the task at hand, the reader might wish to look for variability between manufacturer, between models, between years, or some combination of these.

QUESTIONS

Questions 1-7 refer to Table B

1. What additional information do you need to answer the question below?

   Your car gets 30 miles per gallon (mpg). How much does it cost you for gas if you drive 15,000 miles?

2. If you car gets 32 miles per gallon and gasoline costs $.90, what is your cost per year for gasoline if you drive 15,000 miles?

3. If your car gets 20 miles per gallon, and gasoline prices rise from $.85 to $1.00 per gallon, how much more will you pay if you drive 15,000 miles?

4. If you trade in your car which gets 20 miles per gallon for one which gets 38 miles per gallon, and gasoline prices remain at $.90 per gallon while the distance you drive remains 15,000 miles, how much money will you save?

5. If your car gets 50 mpg. and you drive 15,000 miles, what will you pay for gasoline if it costs $.80 per gallon? If it costs $1.10 per gallon?

6. If your car gets 20 mpg. and you drive 15,000 miles, what will you pay for gasoline if it costs $. 0 per gallon? If it costs $1.10 per gallon?

7. What conclusions can you draw from the above comparisions?

Questions 8-12 refer to Table A and Table C

8. Which cars listed in Table A might be considered compact cars? subcompact cars? standard-size cars?

9. What is the difference in cost per mile of driving between a subcompact and a standard car during the first year?

10. For which size car does the total operating cost decrease by the greatest amount between the first and second years of ownership?

11. Which car has the greatest amount of total space?

12. Which car has the smallest engine?

Questions 13-15 refer to Table D

13. Which car seems to have the best dealer service?

14. Which car seems to have the worst dealer service?

15. Which cars have average dealer service?

16. Pick one car of those listed on Table A and give information about the following factors:

    -Space
    -Miles per gallon
    -Fuel cost per 15,000 miles at 95¢ per gallon
    -Third year cost of operation
    -Dealer service

17. List two problems with using these tables for making comparisons.

TABLE A

Comparison of Sample Automobiles, 1977

		Engine Type				Space	
ame of utomobile	Combined Miles Per Gallon	Cubic Inches	Number of Cylinders	Transmission	Body Type	Passenger (c.u.)	Cargo (c.u.)
atsun -210	40	85	4	M[1]	4DR[3]	68	7
ord Mustang I	26	140	4	M	2DR[4]	72	8
	18	171	6	A[2]	HTBK[5]	70	10
hevrolet amaro	19	250	6	A	2DR	85	6
	17	305	8	M	2DR	85	6
ontiac irebird	19	231	6	M	2DR	85	7
	17	350	8	A	2DR	85	7
oyota orolla	39	71	4	M	2DR	75	9
	28	97	4	A	HTBK	75	12
hevrolet ova	21	250	6	M	2DR	90	13
odge Aspen	23	225	6	M	2DR	87	15
	18	318	8	M	4DR	98	15
ord Fair-ont	26	140	4	M	2DR	95	17
	22	200	6	A	4DR	96	17
ldsmobile utlass	22	260	8	A	4DR	101	16
lymouth ury	16	318	8	A	4DR	101	20
adillac	15	425	8	A	2DR	107	20
ldsmobile elta 88	19	350	8	A	4DR	111	20

		Engine Type				Space	
Name of Automobile	Combined Miles Per Gallon	Cubic Inches	Number of Cylinders	Transmission	Body Type	Passenger (c.u. ft.)	Cargo (c.u. ft.)
Datsun 280Z	21	168	6	M	HTBK	NA	NA
Dodge Diplomat	19	225	6	A	4DR Wgn.	98	39
Pontiac Safari	18	350	8	A	4DR Wgn.	111	51

Source: 1978 Gas Mileage Guide.

Footnotes:
1. Manual transmission
2. Automatic transmission
3. DR = door
4. HTBK = Hatchback
5. WGN = Station Wagon

TABLE B

Fuel Costs, In Dollars, Per 15,000 Miles

Example: If you pay an average of 1 dollar per gallon and your car gets 12 mpg, your fuel cost for 12,000 miles of driving is $1,000. If you own a car that gets 20 mpg, your annual fuel cost for 15,000 miles is $600.

Cost Per Gallon

Combined MPG	$1.10	$1.05	$1.00	$.95	$.90	$.85	$.80
50	330	315	300	285	270	255	240
48	343	327	312	296	281	265	250
46	359	343	326	310	294	277	261
44	375	358	341	324	307	290	273
42	394	376	358	340	322	304	286
40	412	394	375	356	338	319	300
38	434	415	395	375	355	336	316
36	457	436	416	395	375	354	333
34	484	462	441	419	397	375	353
32	516	493	469	446	422	399	375
30	550	525	500	475	450	425	400
28	591	564	537	510	483	456	429
26	636	607	578	549	520	491	462
24	686	655	624	593	562	531	500
22	759	725	681	647	613	579	545
20	825	788	750	713	675	638	600
18	936	894	853	812	770	728	687
16	1030	983	937	890	843	796	750
14	1179	1125	1072	1018	964	911	857
12	1375	1313	1250	1188	1125	1063	1000

Source: 1978 Gas Mileage Guide.

ESTIMATED COST OF OPERATING A 1976 MODEL AUTOMOBILE*

	FIRST YEAR 14,500 miles		SECOND YEAR 13,000 miles		THIRD YEAR 11,500 miles		TENTH YEAR 5,7000 miles		AVERAGE 100,000	
	Total Cost	Cost per mile	Total Cost	Cost per mile	Total Cost	Cost per mile	Total Cost	Cost per mile	Total Cost	Cost per mile
STANDARD SIZE	2,716	18.73	2,008	15.44	2,046	17.79	1,005	17.63	17,879	17.88
COMPACT SIZE	1,762	12.14	1,499	12.30	1,567	13.63	869	15.24	14,561	14.56
SUBCOMPACT SIZE	1,442	9.95	1,293	9.95	1,225	10.65	815	14.58	12,718	12.64

*Total cost in dollars, cost per mile in cents.

Cost calculations include consideration of each of the following factors: Depreciation, Repairs and Maintenance, Tires and Accessories, Gasoline and Oil, Insurance, Parking and Tolls, Taxes and Fees, including Gasoline and Oil, Registration, Sales, and Tires.

NOTE: Due to gasoline cost increases since 1976, these figures are lower than actual current cost.

Source: 1978 Consumer Report.

Cluster 7

THE AUTOMOBILE
AND AMERICAN LIFE STYLE: 1910-1935

A module for teaching high school students
about the impact of the automobile upon
the American life style with the aid of quantitative concepts.

Project QUESST
Boulder, Colorado
September, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Student Materials

    1. The Power Shortage.
    2. Pittsburgh Central Business District Traffic.
    3. Automobile Registration.
    4. Distance to Work.
    5. Worksheet.
    6. Table of Ward Growth 1910-1930 in Pittsburgh.
    7. Ward Map of Pittsburgh.
    8. Nationwide Emission Trends, 1940-1970.
    9. Total Population, Motor-Vehicle Registrations, and Motor-Fuel Consumption.
    10. Percent of American Work Force Employed in Automobile and Automobile Related Industries - 1970.
    11. Death Rates for Motor Vehicle Accidents: Death-registration States, 1900-32, and United States, 1933-60.

OVERVIEW OF THE MODULE

Introduction

Henry Ford and the Model T put America on wheels. Today, it is difficult to envision American society without the automobile. Our residency patterns, urban land use, and location of retail purchasing centers all reflect the influence of the automobile. After a short exercise examining the impact of the automobile, students consider data presented by tables and graphs to hypothesize about the correlation between automobile ownership and changing urban demographics. The exercise concludes with a consideration of the benefits and disadvantages of the use of the automobile and an analysis of some problems associated with the use of statistics in this area.

Description of Materials

Courses and Topics:

American History: The 1920's.

Social Problems: Transportation and pollution.

Environmental Issues: Air pollution.

Urban Studies: Residency patterns in metropolitan areas.

Grade Level: 10-12.

Time Required: Three class periods.

Concepts and Skills:

Social Studies Concepts: Residency patterns, life style, and technology.

Quantitative Concepts: Graphs, tables, and percentage.

Thinking Skills: Interpreting, generalizing, synthesizing, and hypothesizing.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Analyze and synthesize data presented in graphs and tables in order to hypothesize about how a technological development, the invention and use of the automobile, changed the American life style.
2. Make a decision about the value of the automobile after considering some of trade-offs associated with automobiles, including pollution vs. mobility and energy costs vs. employment.

Sources of Data:

Data for this module came from the following sources: CBD traffic patterns derived from E.K. Morse, Report of the Transit Commission to the Honorable Mayor and the City Council of the City of Pittsburgh (Pittsburgh, 1917); B.W. Marsh & L.W. McIntyre, Report and Recommendations of the Central Business District Street Traffic Survey (Pittsburgh, 1927). Data about automobile registration came from the following sources: U.S. Bureau of Public Roads and Department of Highways of the Commonwealth of Pennsylvania, Report on the Survey of Transportation of the State Highways of Pennsylvania (n.p., 1928); Department of Revenue of the Commonwealth of Pennsylvania, Bureau of Motor Vehicles, "Statement of Receipts by County" (n.p., 1929) U.S. Department of Transportation, Highway Statistics: Summary to 1975 (Washington, D.C., 1975). Distance to work data was taken from Joel Tarr with the assistance of Dan Nichols, The Automobile and the Smokey City: The Impact of the Motor Vehicle on Population Distribution, Building Patterns, Industrial Locations and CBD Traffic Patterns in Pittsburgh and Allegheny County 1910-1930 (Pittsburgh, Transportation Research Institute, Carnegie-Mellon University, 1975).

Data about city growth rates came from the appropriate Population volumes of the Thirteenth, Fourteenth, and Fifteenth Censuses. Automobile ownership by wards was derived from Bureau of Business Research, University of Pittsburgh, Real Property Inventory of Allegheny County (Pittsburgh, 1937). Nationwide Air Pollution Emission Trends 1940-70, Research Triangle Park, N.C.: (U.S. Environmental Protection Agency, Research Triangle Park, N.C.: 1973), provided data about fuel consumption. Robert Grove & Alice Hetzel, Vital Statistics Rates in the United States 1940-60 provided data about death rates from automobile accidents. The Employment & Training Report of the President 1977 was the source of data used in construction the circle graph about the work force in the automobile and related industries.

LESSON 1: THE IMPACT OF THE AUTOMOBILE: 1910-1935

Introducing the Lesson

1. Indicate to students that we are often unaware of many important items in our lives. The following is designed to increase our awareness of how much our lives are shaped by one product, the automobile. Distribute "The Power Shortage" (Student Materials #1). After students read this article, ask them to use it as a model for writing a short essay about how their personal lives might be different if automobiles suddenly vanished from the American scene. To make the issue realistic, one might introduce the assignment by having students imagine that another war has occurred in the Middle East and we can no longer import the oil we need. The President has issued an emergency decree which reserves all gasoline for the military and public transportation, and bans all private civilian use of gasoline. After students complete their essays, discuss: How important is the automobile to most Americans? Students should at least mention the impact of the automobile on economic and social factors such as:

   --distance from home to place of employment.

   --distance from home to shopping areas.

   --mobility required for social activities, meetings, dating, etc.

   --businesses and services related to the automobile.

   In conclusion, students should be able to describe the pervasive impact of the automobile on the American life style.

Developing the Lesson

2. Indicate to students that the following activities are designed to examine the impact of the automobile on the United States. However, before we can examine the impact, it would be helpful to identify the time period when the automobile began to exert an influence. In order to help us focus our research

effort, we have selected data from Pittsburgh, Pa., between 1917 and 1927. We selected this city and time period because data was readily available and data from Pittsburgh during this time period reflects national trends. Distribute the table of traffic in the Pittsburgh Central Business District (CBD) 1917-1927, (Student Materials #2), and discuss students responses to the list of possible conclusions. These tentative conclusions are based on data from one city. Conclusion 9 is really a hypothesis which will be tested later with data from the entire country.

NOTE: The teacher may have to introduce students to the concept of hypothesis. A hypothesis is an educated guess based upon available evidence, but it is tentative and should be tested by gathering additional evidence.

Before actually discussing the data in the table, the teacher may wish to ask students to consider the advantages and disadvantages of using percentages and absolute figures. Percentages can provide a quick assessment of the degree of change, but provide no data about the size of the sample involved. Absolute figures, on the other hand, provide accurate data about the sample size, but are less useful in ascertaining the comparative amount of change.

NOTE: Conclusions 1-4 are clearly supported by the data in the table. Conclusion 5 is not supported since there are no figures describing street cars, railroads, and other forms of public transportation. Conclusions 6-9 are inferences. That is, the data in the table does not directly prove that they are true, but they do seem likely given the data in the table.

--What kind of additional information might you desire to test hypothesis #9 and where might you find that information? One obvious answer would be automotive registration data, but other indirect indicators such as highway construction, number of accidents, road construction espenses, and gasoline consumption might be suggested. Much of this data can be located in the government documents section of large libraries.

3. Distribute State and national automobile registration tables, (Student Materials #3).

--Does this data support or contradict the earlier hypotheses that automoible ownership increased? Supports it.

--Why do you think that figures about both absolute automobile registration and persons persons per automobile are provided? Absolute figures indicate the magnitude of change in the number of automoibles present. However, it is possible that the change in registration figures could reflect a drastic increase in the number of people in the area under consideration. Therefore, data about the number of persons per automobile is also presented. In addition, the persons per automobile data may provide a more accurate view of how many individuals actually had contact with the automobile. As the ratio of persons to automobiles decreases, it seems logical to infer that there is an increase in the probability that more individuals will have some contact with automobiles. A logical inference is that more automobiles registered reflects an increase in automobile ownership.

--What are some of the problems associated with using different statistical bases, i.e. state and national data? Different data collection techniques, e.g., door to door interviewing or use of registration data, may produce different types of results. Comparing small and large areas may be misleading because the change may not occur evenly across the large area. For example, much of the growth in automobile registration in the United States may have occurred in Pennsylvania and several other states. By simply looking at national data, this would not be apparent. To show students that the percentage of change for a part of a larger area. Have students compute the percentage of change in automobile registration in Pennsylvania between 1900 and 1929 and do the same with that of the United States.

Pennsylvania $\frac{1,519,387}{1,480} \times 100\% = 1,026.6\%$ increase

United States $\frac{22,972,745}{8,000} \times 100\% = 2,871.6\%$ increase

Concluding the Lesson

5. Having established, both in Pennsylvania and the United States, that a dramatic rise in the number of automobiles occurred between 1917 and 1927, it is time to examine one impact of this change. Distribute the "Distance to Work" graph (Student Materials #4) describing the mean distance attorneys traveled to work.

   --What conclusions might be drawn from this data and how do they relate to data from the previous exercise? The most obvious conclusion is that attorneys traveled increasing distances to go to work. This suggests that improvements in the availability and ease of use of transportation might be a factor facilitating greater mobility. Greater use of the automobile would make transporation more available and facilitate mobility.

> Use of the graph of the distance lawyers traveled to work depends upon an inference. Having an above average income, lawyers probably had a higher percentage of automobile ownership than the average city. If the mean distance attorneys traveled to work increases, it might reflect the influence of more accessible transportation facilities. Since the automobile greatly facilitated ease of transportation, we might infer that the automobile allowed lawyers to live greater distances from their place of employment. Actually, as the graph suggests, the movement away from the CBD began before the introduction of the automobile. This trend can be traced to the introduction of the omnibus which was followed in rapid succession by the horse drawn street car, commuter railroad, cable cars, and motorized street cars. But it was transporation innovation which produced the suburban residential patterns around our cities, and the automobile represented a transportation innovation which contributes to suburban growth.

6. Have the class divide into groups of 4 to 6 students. Distribute worksheet #1, the Table of Ward Growth Rates, 1910-1930 and 1937 automobile ownership, and the map of the City of Pittsburgh (Student Materials #5, 6, and 7). Have students complete the worksheet. Discuss the answers. Answers are provided in an answer sheet, Supplementary Teacher Materials #1.

LESSON 2: THE VALUE OF THE AUTOMOBILE

Introducing the Lesson

The previous lesson examined the evolution and one impact of the expansion of automobile ownership. This lesson focuses upon an examination of the value of the automobile to American society today. Like many technological developments, the automobile has brought both benefits and disadvantages.

1. Ask students to brainstorm positive and negative results of the explosion in automobile ownership. List these in two columns, one positive and one negative, on the chalkboard.

Developing the Lesson

2. Distribute the tables on carbon monoxide, nitrogen oxide, and hydrocarbon air pollution (Student Materials #8). With each table of air pollutants ask:

--What trends appear over time? Pollution increases.

--What trends appear for each topic? The total for each substance increases. But in several instances there are decreases from individual sources, especially from stationary sources because of pollution controls.

--How important are transportation vehicles as a source of air pollution? Very important, because in most of these examples transportation vehicles are the biggest single source of pollution.

--What is the biggest source of air pollution from transportation vehicles? Gasoline vehicles.

--How important do you think automobiles are as a source of air pollution? Very important. They account for one third to one half of the air pollution in each of these categories.

--After examining all of the air pollution tables, what might be some results of air pollution from automobiles? Health hazards and property damage.

3. Distribute the Total Population, Motor Vehicle Registrations, and Motor Fuel Consumption Graph (Student Materials # 9) and ask:

   --Which is increasing faster, resident population or vehicle registration? Registration.

   --As registration increases, what happens to fuel consumption? It also increases at about the same rate.

   --Based upon the graphs, what predictions would you make for the future direction of each of the four graphs? They will increase.

   --What might be some implications of increasing vehicle registration? There are many possible answers including, rising fuel consumption, increased trade deficits as a result of higher oil imports, crowded highways, increased road construction expenses, and possibly more pollution.

   --What are some implications of the rising demand for gasoline? There are many possible responses to this question including:

   --the possibility of shortages.
   --more pollution since more fuel burned usually produces more pollution.
   --higher trade deficits since each year we import oil at increased prices.

   --Are you aware of any efforts being made to improve the mileage obtained by the average car? Yes, Congress has passed legislation that will require automobile manufacturers to produce cars which obtain better mileage. Also, as gasoline prices climb, buyers are turning to cars which have better mileage. This purchasing pressure also encourages manufacturers to build cars that get better mileage.

4. Distribute the circle graph describing the percentage of American workers employed in automobile and automobile-related industries (Student Materials #10) and ask:

   --What percent of the American work force is employed in automobile and related industries? 16.75%

--If automobiles were banned and these people were thrown out of work, what might happen? There would be a great deal of unemployment, government unemployment costs would rise dramatically, the unemployed could not buy goods, and other factories might be forced to stop production.

5. Distribute the Death rates for accidents chart (Student Materials #11) and ask:

--Approximately how many persons per 100,000 died in 1960 from injuries received in automobile accidents? 22. More people have been killed in automobile accidents than in all of America's wars added together.

--What do you feel could be done to reduce this number of fatalities? There are many options including:

--safer automobiles.
--better roads.
--better driver training.
--better law enforcement and stiffer penalties, especially for driving while intoxicated.

--How could we obtain each of the items which would reduce fatalities? For example, automobiles might include safety features in response to federal legislation.

Concluding the Lesson

6. Ask students to re-read their essay about what life would be like without the automobile and consider the data just discussed above in Lesson 2, Activity 2. Take a position in favor of or against the automobile.

--Has it been basically a good invention or has it caused more problems than it has solved?

--Knowing what we know now, if we didn't have the automobile, would you be in favor if its invention?

7. Have students select the best two reasons for their position. Have students who adopt the same attitude towards the automobile form groups of 4 or 5 and share their reasons. Select the best two reasons from each group and use them in a general class discussion about the benefits and problems resulting from the mass distribution of automobiles. Also consider what other questions students could generate to be answered before they decide a position, e.g., how do automobile death rates compare to other death rates?

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

This module introduced students to the impact that a technological change, the widespread use of the automobile has upon the American life style. Specifically, students examined charts and graphs in order to formulate hypotheses about how the automobile facilitated the development of suburban areas in a major American city. This local data later was compared with national data in order to generalize conclusions to the entire country. Finally, students examined data describing both positive and negative results of automobile usage and they used that data to formulate a value statement about the benefits of the automobile to American society.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of this module.

1. Have one or more students locate data about the construction dates of various shopping centers in the area. Is there a pattern? Compare their total retail sales volume with that of similar stores in the CBD. What does this data indicate about the impact of the automobile upon retail sales patterns?

2. Have one or more students investigate proposed controls in urban areas to limit access by private automobiles. Interview a city planner and discuss why urban areas are taking these steps. If cars are banned from CBD's what does this mean to car owners, shop keepers, transportation systems, suburban stores, and others who would be influenced?

3. Have one or more students investigate alternative transportation, its benefits and problems. What are some modes of alternative transportation? When will they be ready for use? Why haven't they been developed sooner? Who is developing them? Do you think they will replace cars? Why or why not?

4. By looking at a city map have students determine what percentage of total CBD areas is lost to parking facilities. What are the economic implications of this loss. If large areas of the city are used for parking, what probably happens to the taxes on other real estate. Might there be a better use for this land, such as parks, play grounds, stores, high-rise apartments?

5. Have several students record the mileage and use of the family car for a week or two. Who uses the car? What do they use it for? Who drives the most miles and why? What conclusions can they draw about the impact of the automobile upon family life styles.

   This activity might be started a week or two before actually beginning Activity 1.

WORKSHEET #1

1. Which ward had the largest increase in population between 1910 and 1930? 14.

2. Which ward had the lowest ratio of persons to cars? 14.

3. Which ward had the greatest decline in population? 2.

4. Which ward had the highest ratio of persons to cars? 2.

5. Wards 5, 7, 13, 14, 19, 26, and 27 are served by new or older main roads. How does the population increase in these wards compare with that of the city average? It is higher.

6. How does the rate of automobile ownership for these wards compare with the city average? These areas have more cars per person.

7. What wards lost population? 1, 2, 17, 23.

8. How do their ratios of persons to automobiles compete with the city average? They are higher. They had more persons per automobile than the city average.

9. What does the table of Ward Growth Rates indicate and how can it be related to the map? Population growth continued to expand rapidly in areas outside of the Central Business District, especially in areas with access by road.

THE POWER SHORTAGE

Often we pay little attention to items on which we depend daily. We just take them for granted and assume that they will always be there. Some things have become such a regular part of our lives that we do not stop to visualize how many different parts of our lives they touch and how life would be different if they suddenly vanished. It is not easy to produce this mental picture. But let us attempt it by imagining how the loss of electricity would influence the typical middle class suburban American family.

Most of us have read about or experienced power shortages or failures--brown outs and black outs. Imagine that on a hot summer day a minor malfunction in a transformer sets off a series of events which causes a massive power failure across a dozen states. In fact, the damage is so great that it becomes impossible to obtain power from neighboring areas and the damaged equipment cannot be repaired or replaced completely in less than two months.

When the power fails the following changes strike our typical family. Their electric range, refrigerator, disposal, trash compactor, and dishwasher become useless. Whatever food is refrigerated spoils. Electric can openers, knives, fans, air conditioners, television, and radios without batteries stop functioning. Lights, electric clocks, washers, dryers, water heaters, electric skillets, coffee pots, drills, saws, lawn mowers, hedge trimmers, chain saws, blenders, food processors, slow cookers, mixers, dryers, shavers, hair curlers, vacuum sweepers, doorbells, woks, pizza makers, knife sharperners, ice crushers, typewriters, electric garage doors, freezers, irons, toy trains, race cars, toys with power packs, and toothbrushes become useless. They are forced to cook canned food over their camp stove until they are unable to buy either the food or fuel for the stove. Just as most functions within the home are disrupted, conditions outside become chaotic. Gas stations quit pumping because their pumps have no power. The water supply also stops when water cannot be pumped. All plumbing and sanitation devices becomes useless, and the little brown buildings of 100 years ago spring up in backyards. Traffic snarls without signal lights, and then vanishes as fuel becomes scarce. Delivery of all types of goods is disrupted. The frozen and refrigerated foods in grocery stores spoil.

Crime increases in the dark nights and drive-ins and movie theaters cannot open. Evening entertainment ceases without lights. So, the family sits at home at night and tries to protect its property. Newspapers are unable to print and businesses must close at dark, if they were able to open at all since lights, cash registers, and electric doors would not operate. Most factories stop production since they do not have the power to operate machinery. Elevators quit running and giant office buildings become dark, useless cylinders. Workers are laid off and their families have no money. In short, the loss of electricity touches almost every aspect of public and private life.

PITTSBURGH CENTRAL BUSINESS DISTRICT TRAFFIC PER DAY

	1917	1920	1927	Total Change *	% change
AUTOMOBILES	9,911	32,416	68,133	+58,222	+586%
TRUCKS	6432	20,554	22,623	+16,191	+251%
HORSES	8370	7545	1823	-6,547	-78.2%

Source: Report of the transit Commission to the Honorable Mayor of the City Council of the City of Pittsburgh, Report and Recommendations of the Central Business District Street Traffic Survey.

* Total change refers to the absolute change in the number of vehicles in each category entering the CBD per day in 1927 compared to 1917.

Which of the following tentative conclusions (hypotheses) are suggested by the table above? Support your answers with evidence.

1. Between 1917 and 1927 the total number of vehicles entering the Pittsburgh central business district per day increased.
2. Between 1917 and 1927 the number of automobiles entering the Pittsburgh central business district per day incresed.
3. Between 1917 and 1927 the number of horses entering the Pittsburgh central business district per day decreased.
4. Between 1917 and 1927 the number of trucks entering the Pittsburgh central business district per day increased.
5. Between 1917 and 1927 the number of people entering the Pittsburgh central business district increased.
6. Between 1917 and 1927 horse ownership in Pittsburgh decreased.

7. Between 1917 and 1927 automobile ownership in Pittsburgh increased.

8. By 1927 more goods were shipped by trucks than by horses in Pittsburgh.

9. If Pittsburgh is representative of most major American cities between 1917 and 1927 automobile ownership in other cities also is probably increasing.

10. What other conclusions might you draw from this data?

STATE AND NATIONAL AUTOMOBILE REGISTRATION TABLE

Location	1900	1910	1920	1929
Pennsylvania	1,480	36,277	570,200	1,519,387
United States	8,000	458,377	8,131,522	22,972,745 *

* 1930 Figures

NUMBER OF PERSONS PER REGISTERED AUTOMOBILE

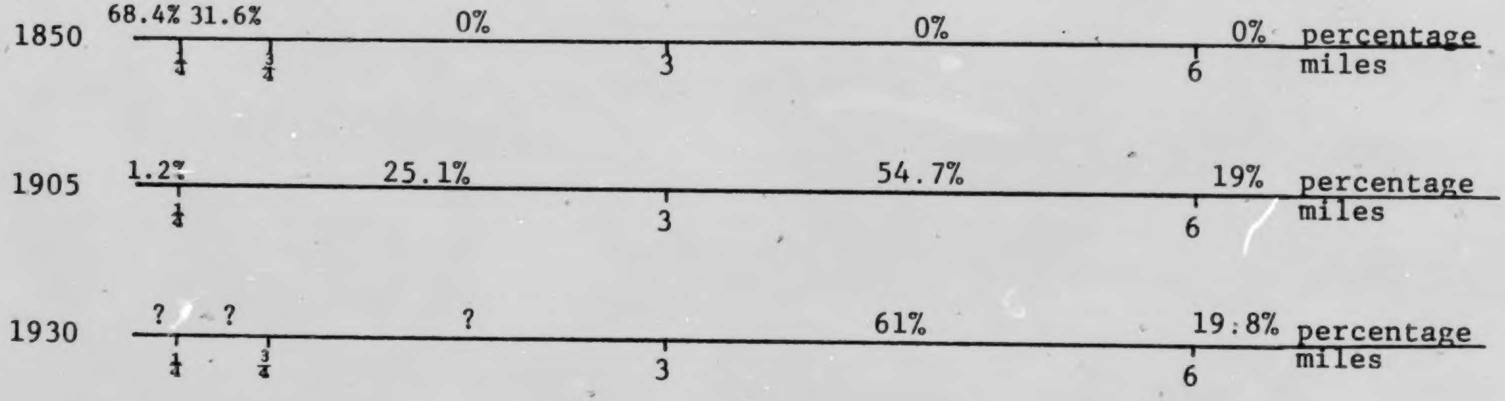
Location	1900	1910	1920	1929
Pennsylvania	4,258.2	205.2	15.3	5.4
United States	9,499	201	13	5.3 *

*1930 Figures

Source: Report on the Survey of Transportation on the State Highways of Pennsylvania, Highway Statistics: Summary to 1975.

DISTANCE TO WORK

Percent of attorneys living within the given distance from place of employment.



Source: Joel Tarr with the assistance of Dan Nichols, *The Automobile and the Smokey City*, 1975, p. 18.

WORKSHEET #1

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6. How does the rate of automobile ownership for these wards compare with the city average?

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7. What wards lost population?

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8. How do their ratios of persons to automobiles compete with the city average?

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9. What does the table of Ward Growth Rates indicate and how can it be related to the map?

____

____

____

TABLE OF WARD GROWTH 1910-1930 AND 1937 AUTOMOBILE OWNERSHIP IN PITTSBURGH

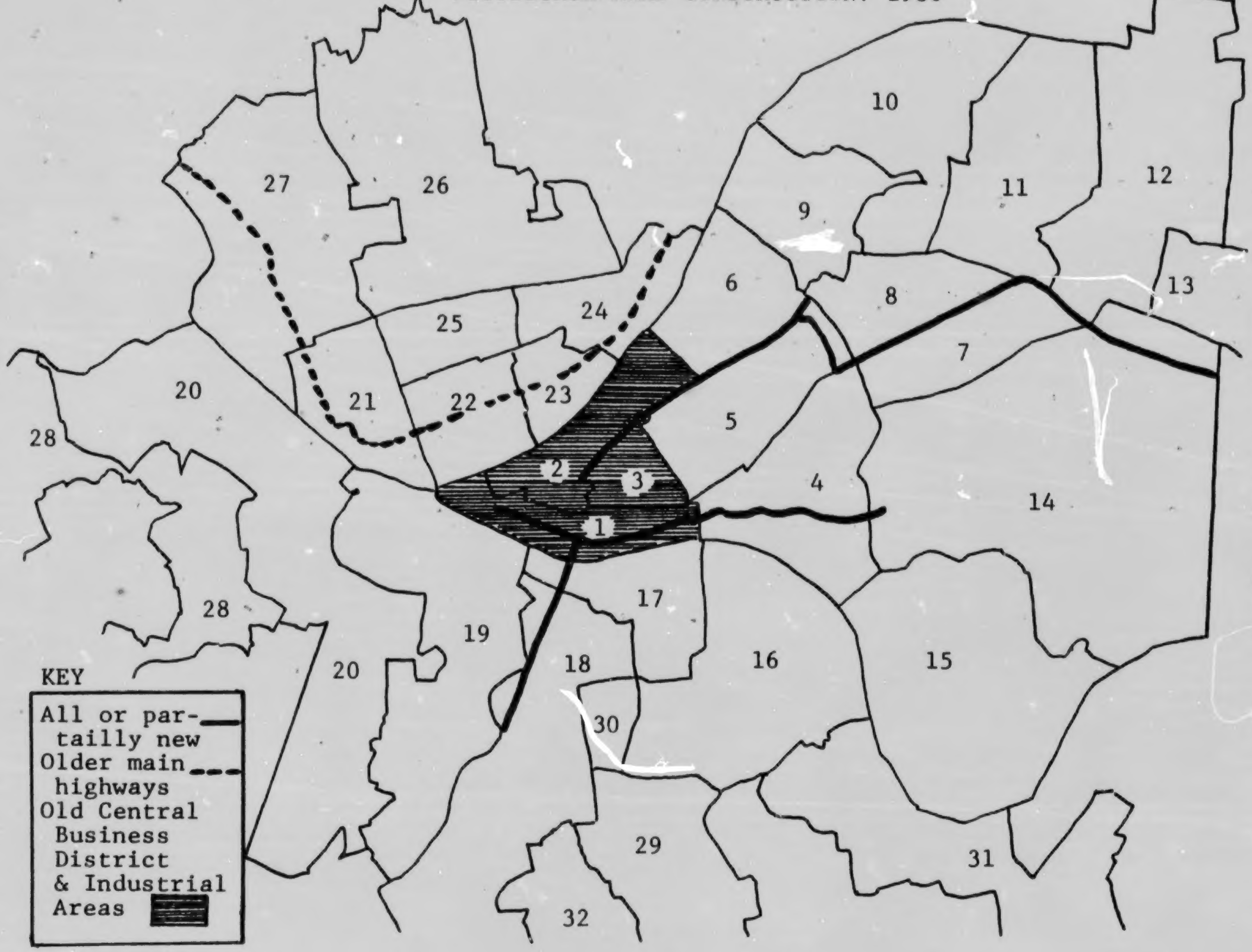
Ward #	Percent of Population Change*	No. of Persons Per Automobile **
1	-17.87%	70.7
2	-53.37%	108.2
5	19.12%	28.16
7	29.12%	7.59
13	25.95%	15.45
14	206.77%	4.9
17	- 7.35%	68.30
19	76.64%	10.57
22	0.97%	40.58
23	-20.60%	40.06
26	54.11%	9.69
27	19.75%	12.44
Entire City***	17.3 %	14.88

*** This data does not include growth from annexation.

* Source: _Thirteenth_ and _Fifteenth Census of the United States_.

** Source: _Real Property Inventory of Allegheny County_.

PITTSBURGH ROAD CONSTRUCTION: 1930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1
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28
19
18
16
15
20
30
29
31
32
KEY
All or partailly new
Older main highways
Old Central Business District & Industrial Areas

WARD MAP OF PITTSBURGH

NATIONWIDE EMISSION TRENDS, 1940-1970
CARBON MONOXIDE

The principal contributor of CO emissions is fuel combustion in mobile sources. The percentage of total controllable carbon monoxide emissions from these sources has increased substantially since 1940. Table 1 lists the amounts of CO emitted by the principal source categories. Dramatic overall increases in CO emissions until the late 1960s are due almost exclusively to the increased use of automobiles. Since 1968, automobile emissions have declined because of the installation of emission control devices. There has been a steady increase in emissions from uncontrolled nonhighway vehicles such as snowmobiles, tractors, etc. since 1940. Two other important sources of CO emissions are agricultural burning and industrial process losses; emissions from these sources have remained fairly constant.

TABLE 1 - NATIONWIDE ESTIMATES OF CARBON MONOXIDE EMISSIONS, 1940-1970

(10^6 tons/year)

Source category	1940	1950	1960	1970
Fuel combustion in stationary sources	6.2	5.6	2.6	0.8
Transportation	34.9	55.4	83.5	111.0
Solid waste disposal	1.8	2.6	5.1	7.2
Industrial process losses	14.4	18.9	17.7	11.4
Agricultural burning	9.1	10.4	12.4	13.8
Miscellaneous	19.0	10.0	6.4	3.0
Total	85.4	103.0	128.0	147.0
Total controllable[1]	66.4	92.9	121.0	144.0
Percent of controllable emissions from transportation sources	52.6	59.6	69.0	77.1

[1] Miscellaneous sources not included.

Source: Nationwide Emission Trends, 1940- 1970.

HYDROCARBONS

Uncontrollable emmisions from miscellaneous sources account for roughly 15 to 20 percent of HC emissions. The quantity of emissions from these sources has been nearly constant since 1940.

TABLE 2 - NATIONWIDE ESTIMATES OF HYDROCARBON EMISSIONS, 1940-1970

(10^6 tons/year)

Source category	1940	1950	1960	1970
Fuel combustion in stationary sources	1.4	1.3	1.0	0.6
Transportation (non-gasoline vehicles)	0.5	1.4	1.9	2.9
Gasoline vehicles	6.9	10.4	16.1	16.6
Solid waste disposal	0.7	0.9	1.3	2.0
Industrial process losses	3.3	5.2	4.3	5.5
Agricultural burning	1.9	2.1	2.5	2.8
Miscellaneous	4.5	4.2	4.4	4.4
Total	19.1	25.6	31.6	34.7
Total controllable[1]	14.7	21.4	27.2	30.3

[1] Miscellaneous sources not included.

Source: Nationwide Emission Trends, 1940-1970.

NITROGEN OXIDE

Emission of controllable nitrogen oxides almost exclusively results from fuel combustion in mobile and stationary sources; each source category contributes about half of the total amount emitted. Solid waste disposal, industrial process losses, and agricultural burning together account for less than 5 percent of NO_x emissions. Increased NO_x emissions from the manufacture of TNT might have been expected in 1950 and 1968 due to increased arms production; however, such data were not available. Nationwide estimates of emissions from the major sources are presented in Table 3. Controllable nitrogen oxide emissions show a continuing upward trend from 1940 through 1970. Automotive pollution control devices, although helpful in reducing CO and HC emissions, are basically ineffective in reducing NO_x, and in some cases even result in increased NO_x emissions. Thus, we do not see the reduction in NO_x emissions in 1969 and 1970 which occurred in CO and HC emissions during those years.

TABLE 3 - NATIONWIDE ESTIMATES OF NITROGEN OXIDE EMISSIONS. 1940-1970

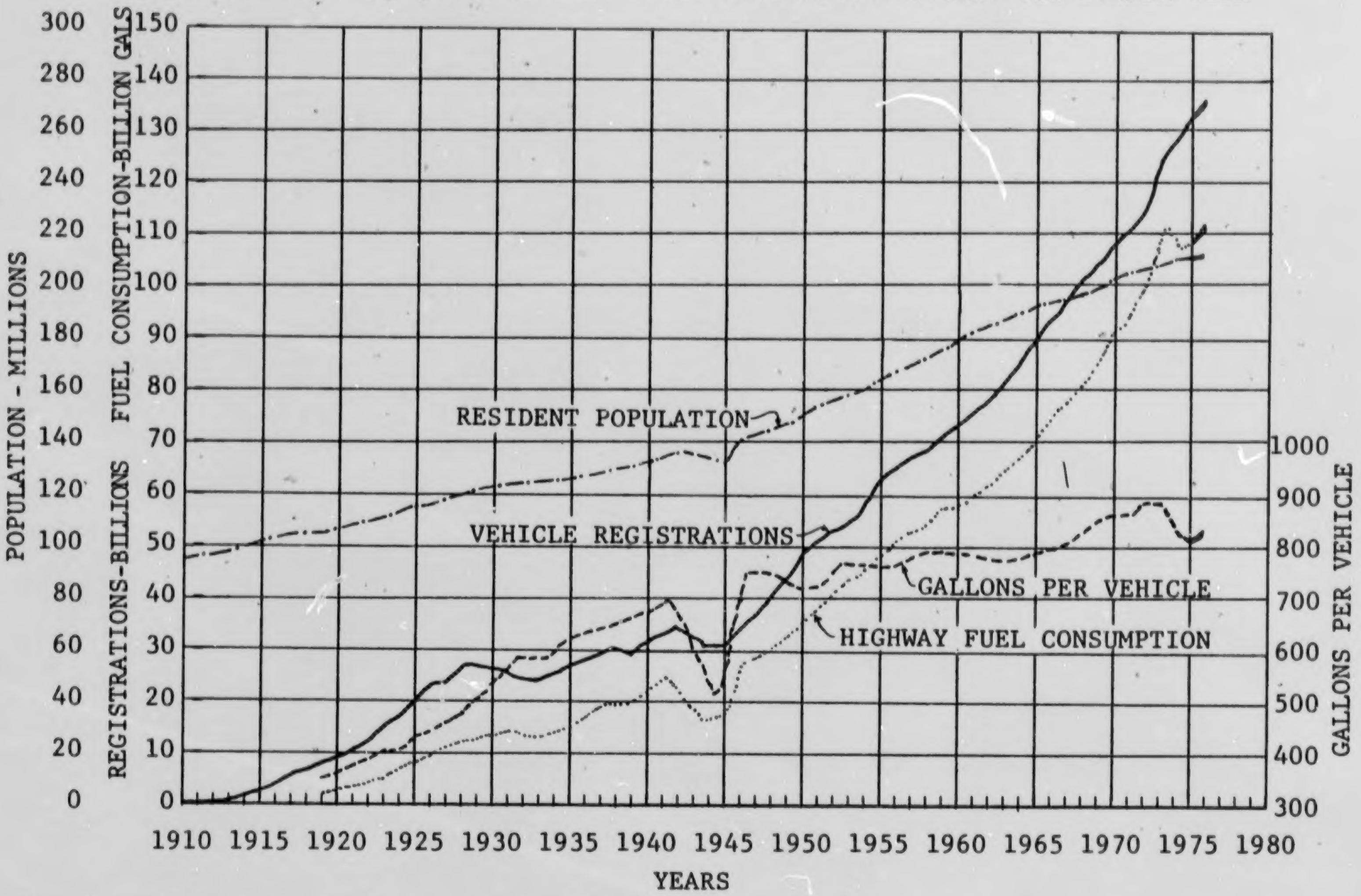
(10^6 tons/year)

Source category	1940	1950	1960	1970
Fuel combustion in stationary sources	3.5	4.3	5.2	10.4
Transportation (non-gasoline vehicles)	0.3	0.8	1.2	3.9
Gasoline vehicles	2.9	4.4	6.8	7.8
Solid waste disposal	0.1	0.2	0.2	0.4
Industrial process losses	Neg[2]	0.1	0.1	0.2
Agricultural burning	0.2	0.2	0.3	0.3
Miscellaneous	0.8	0.4	0.2	0.1
Total	7.9	10.4	14.0	22.7
Total controllable[1]	7.1	10.0	13.8	22.6

[1] Miscellaneous sources not included.
[2] Negligible (less than 0.05×10^6 tons/year).

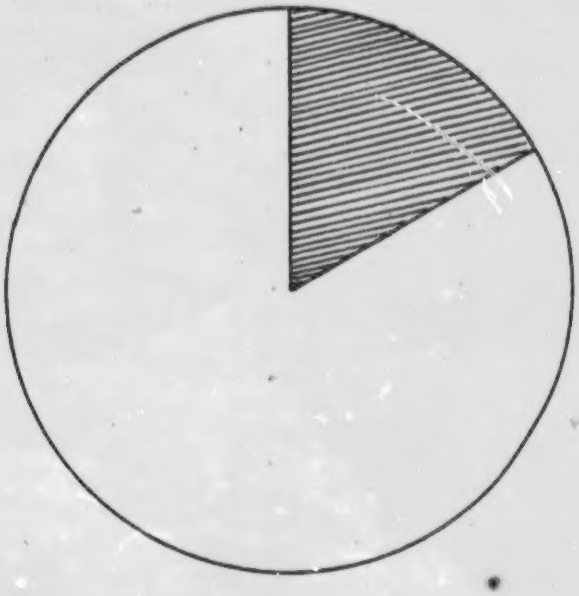
Source: Nationwide Emission Trends, 1940-1970.

TOTAL POPULATION, MOTOR-VEHICLE REGISTRATIONS AND MOTOR-FUEL CONSUMPTION



Source: Highway Statistics, Summary to 1975, U.S. Department of Transportation.

PERCENT OF AMERICAN WORK FORCE EMPLOYED IN AUTOMOBILE AND AUTOMOBILE RELATED INDUSTRIES 1970

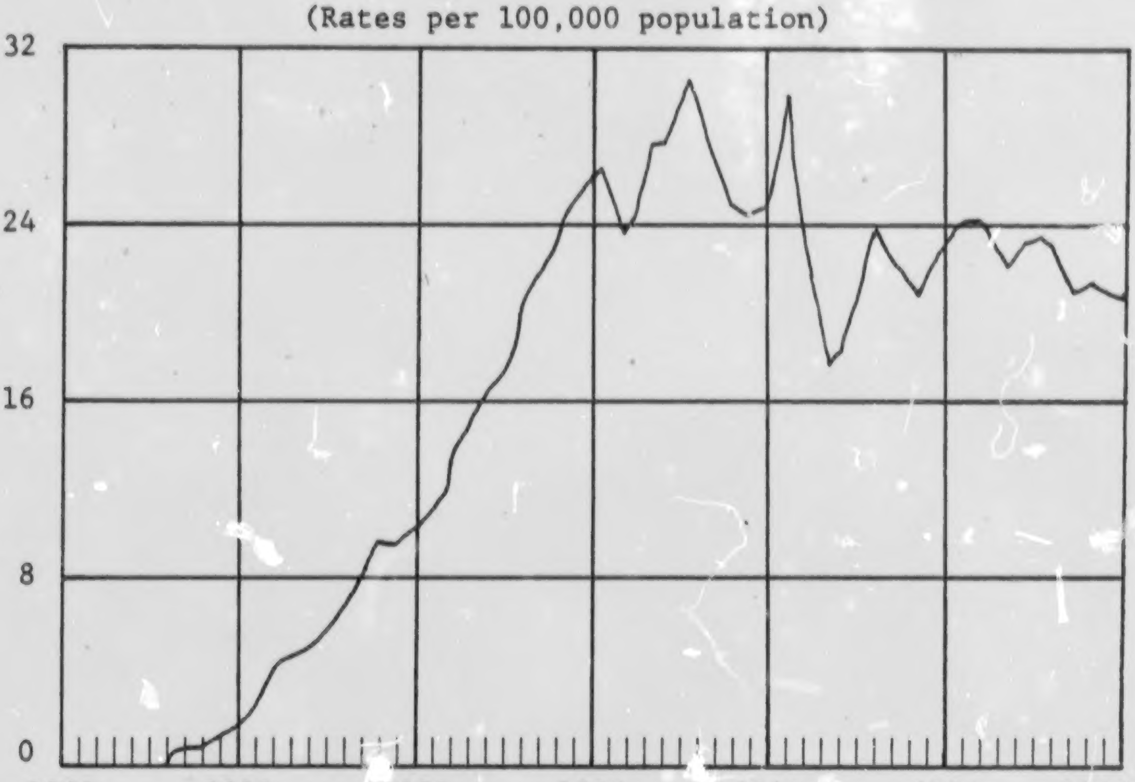


Key

Automobile and automobile related work force....... ▨
All other workers.................................. ☐

Source: Employment and Training Report of the President, 1977.

DEATH RATES FOR MOTOR VEHICLE ACCIDENTS: DEATH-REGISTRATION STATES, 1900-1932 AND UNITED STATES, 1933-1960



Source: Statistical Abstract of the United States: 1940-1960.

ADVANCES IN MEDICAL TECHNOLOGY AND CHANGING LIFESTYLES

A module for teaching high school students
about the impact of changing medical technology
with the aid of quantitative concepts.

Project QUESST
Boulder, Colorado
October, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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MEDICAL TECHNOLOGY

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Student Materials

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2. Advances in Medical Technology: Reading a Table.
3. Life Expectancy at Birth 1900-1971.
4. Selected Major Causes of Death 1900-1975 in the U.S.
5. Medical Research and Hospital Care Costs.
6. Medical Technology.
7. Median Age for the United States Population 1950-2050.
8. Percentage of the United States Population Age 65 and older 1950-1990.
9. Older people a growing problem in Great Britain.

OVERVIEW OF THE MODULE

Introduction

Modern medical science has extended the average life span by over twenty years during the course of this century. As a result, the dreaded killers of yesteryear no longer threaten the population, but different illnesses have replaced them as leading causes of death. Many of these diseases are characteristic of the aged. The success of medical technology, then, has altered the kinds of problems faced by doctors. In addition, the changes in medical technology contribute to a changing age structure of the American population. Our society is aging and this trend poses dilemmas for future social policy decisions. Students investigate some of these issues through the use of data in tables and graphs.

Description of Materials

Courses and Topics:

Current Social Problems: Aging.

Sociology: Changing Social Demographics.

American History: Technological Advances of the 20th Century.

Grade Level: 10-12.

Time Required: Two or three class periods.

Concepts and Skills

Social Science Concepts: Medical technological change.

Quantitative Concepts: Tables, graphs and rank order.

Thinking Skills: Interpreting, comparing, generalizing, and inferring.

Instructional Objectives

At the conclusion of this module, students will be better able to:

1. Recognize and discuss the positive relationship between changing medical technology, changing causes of death, and greater longevity.
2. Read and interpret graphs and tables, and to recognize that graphs allow rapid interpretation of data, but lack the accuracy of tables.
3. Describe how the increasing median age in our society will require changes in social services, occupations, social security, and other aspects of society.

Sources of Data:

All of the data for this unit is derived from government publications. Some trends and Comparisons of United States Life-Tables Data: 1900-1971 (Rockville, Md.: Department of Health Education and Welfare, 1975) provided data about changing life expectancies. Similar data can also be found in the Statistical Abstracts of the United States which is available in the reference section of most libraries.

Forrest Linder & Robert Grove, Vital Statistics Rates in the United States 1900-1940, Washington, D.C.: (United States Department of Commerce, 1943); and Robert Grove and Alice Hetzel, Vital Statistics Rates in the United States 1940-1960, Washington, D.C.: (United States Department of Health, Education, and Welfare, 1968) provided data about causes of death.

The Rapid Rise of Hospital Costs (Staff Report of the Executive Office of the President Council on Wage Stability, 1977) provided information about changing hospital expenses. Pictures are adapted from 1875 and 1884 Harpers Weekly.

CHANGING MEDICAL TECHNOLOGY AND ITS IMPACT

Introducing the Lesson

1. Distribute copies of the advertisements illustrating medical technology (Student Materials #1) in the late 19th century. Have students look at the drawings but not read the texts of the ads. Then, ask:

   --What do you think each of these things is? Allow students a brief time to speculate.

   --What kinds of ailments or diseases were supposed to be cured by these devices? Allow students to speculate briefly, and then have them read the texts of the ads. They will see that the pocket inhaler and electric belt were said to cure everything from Clergymen's sore throat to constipation.

   --How much faith would you have in these devices? Why? Students will probably indicate that they would not have much faith in these cures. They will probably out that they are out of date, and modern medicine has more effective techniques for treating these diseases. They may indicate that one cure for so many ailments is improbable.

   --What are some kinds of modern medical technology? Among the things that may be mentioned are X-ray machines, use of computers for diagnosis, electrocardiogram machines, heart pacemakers, hearing aids , etc.

   --In what ways is today's medical technology different from that illustrated in the ads?

   NOTE: The teacher should be certain that students have a working definition of technology. If students do not understand the concept of technology the teacher might approach the topic by telling students that we often say that the United States has an advanced technology or that some groups of people use a primitive technology. Ask students what we mean when we use these terms. They will probably respond by discussing the kinds of tools and machines a culture uses. After getting a variety of answers and discussing them the teacher should point out that what most of them seem to be saying is that technology is a way of doing something. It can be defined as applied science, as the technical method of achieving a practical purpose.

There are many possible responses to this question, but teachers should elicit at least the following:

Today's technology appears to depend upon more sophisticated machines. It depends upon scientific research. Cures are developed for specific diseases rather than one approach being heralded as a cure-all. Modern technology requires heavy capital investments.

The teacher should explore the relationship between changes in medical technology and changes in the general technology of society. Advances in the general state of technology are also reflected in medical advances.

NOTE: To maintain a balanced perspective the teacher should indicate that some folk remedies have been proven to be effective, and major pharmaceutical companies have invested millions in order to explore these folk remedies and identify their active ingredients. Also discuss negative aspects, such as cancer from X-ray, drug abuse, and harmful side affects.

Developing the Lesson

2. Three tables--"Life Expectancy at Birth 1900-1971", "Selected Major Causes of Death 1900-1975 in the U.S.", and "Medical Research and Hospital Care Costs" (Student Materials #3, #4, and #5), provide the information for this part of the module. Before a discussion of these tables, be sure the students understand all the data contained in them. "Advances in Medical Technology: Reading a Table" (Student Materials #2) will help students to understand the data presented in the tables. Distribute this exercise, allow students a brief time to complete it, and go over their answers with them in a short review session. The answers are provided here for your convenience.

    1. Black males born between 1900 and 1902.
    2. 66.47 years.
    3. 7.94 years
    4. 194.4 persons per 100,000 died of tuberculosis in the U.S. in 1900.
    5. Heart disease.
    6. Influenza and pneumonia.
    7. Tuberculosis.
    8. Heart disease.
    9. 32.78.
    10. .66
    11. 1970-1975.
    12. Nonlabor costs.

3. Now, using Table A, have students compute their remaining life expectancy by subtracting their current age from the expectancy at birth. Then have students compare life expectancy in 1900 with 1971. Construct a line graph of life expectancy 1900-1971.

   --What is the percentage of change? 43.7

   --Is the graph or the table more accurate? The table. Why?

   --Which is quicker or easier to read? The graph. Why?

   --Suggest some possible reasons for the 43.7% increase in average life expectancy during this century. Does discussion of medical technology in activity 1 suggest any reasons? Yes, the changes in medical technology are a contributing factor to longer life expectancy.

   --Can you identify some factors which might influence how long a person lives? Possible answer are diet, occupation, and availability and quality of medical care, in addition to improved medical technology. Indicate that of all of these possible factors, we are going to investigate one, medical technology.

4. Ask students to examine "Selected Major Causes of Death 1900-1975" (Student Materials #4) and discuss the following questions:

   --Can you suggest some possible reasons why the data is presented per 100,000? Absolute figures may be misleading as a result of population changes. Have students construct line graphs of this data and rank order the causes of death in 1900 and 1975, using a separate list for each year.

   --What conclusions might be drawn from the graph and rank order lists? The major killers of 1900 are for the most part not major causes of death in 1975.

   --Do the major causes of death seem to fit into any categories, such as bacterial/virus, accidents, unknown, results of aging? Yes, Tuberculosis, influenza, typhoid, Diptheria, whooping cough, measles, are infectious bacterial/virus types of diseases. Cerebrovascular diseases, heart disease, cancer, diabetes, and arteriosclerosis are usually associated with aging.

--Observing these categories, are any trends noticeable? Yes, bacterial/viral diseases have decreased in importance while diseases of aging have increased.

--Why might these trends occur? Preventive medicine, vaccines, better treatment, and as people live longer, diseases of the aged will be more common.

--Based upon the above evidence, can you describe the impact of medical technology? Students should indicate that medical technology has contributed to a 43.7% increase in life expectancy since 1900. Many dreaded diseases of the past can be cured with modern drugs and procedures.

5. Have the students consider "Medical Research and Hospital Care" (Student Materials #5). Analyze each item of the table beginning with total expenditures for health research.

--What do each of these sets of data suggest about health care and spending? More money and man hours per patient are being invested in hospital care and medical research.

--Why might a hospital now employ more persons per patient day? To operate the many pieces of sophisticated equipment which they have acquired.

--Does all of the evidence on the table support any tentative conclusions? There are several possible responses, but they can be summarized by stating that the medical profession has experienced a technological revolution. Test this conclusion further with the short reading, "Medical Technology" (Student Materials #6). As the students read, they should consider how extensive the technological revolution in medicine has been.

Concluding the Lesson

6. Changing medical technology has influenced society in many ways. Costs have soared, employment opportunities have expanded, and longevity for individuals in our society has increased. Medical technology together with a declining birth rate, improved diet, improved occupational safety, increased availability of medical care, and other factors has contributed to an increase in the median age of members of our society. Distribute the Median Age Table (Student Materials #7), and ask the following questions:

--Can you identify a trend from this table? The average age of members of American society is increasing.

--Can you suggest some possible reasons for this trend?

Distribute the line graph describing the percent of the U.S. population over age 65 (Student Materials #8).

--Does this additional data seem to agree with the data from the Median Age Table? Yes.

--How might society change if the percentage of members over 65 years of age climbs to 17% as projected for 2050? It probably is impossible to envision the full range of the impact of this change. However, some more obvious areas of change may be changes in employment opportunities, recreational facilities, educational facilities, transportation facilities, medical facilities, social security structure, medical insurance plans, community services, moral issues such as the right to die a dignified death, and euthanasia.

Have students examine the graph of the causes of death which they constructed in Activity 2.

--What age group is most stricken by the causes of death which are increasing? The elderly.

Distribute "Older People A Growing Problem in Great Britain" (Student Materials #9). Hold a general class discussion about how these changes in both causes of death and age distribution might influence the allocation of national resources and the life style of Americans? Clearly, a greater percentage of the national resources must be allocated to meeting the needs of the elderly. The reallocation means that the resources must be taken from groups currently receiving them and applied to new groups. This topic might be expanded by having students examine how our society deals with the elderly.

--How do the families of individual students deal with their elderly members?

--How do you think you would feel if you were treated that way?

--How might care for the elderly be improved? Students may wish to spend some time talking with residents of a home for the aged.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered by this module.

This module presents students with data about changing life expectancies and causes of death between 1900 and 1975. Using this data, students explore the dimensions of the technological revolution in the area of medicine. They examine the impact of the technological revolution upon longevity and the implications which an increasing median age holds for our society. Students use data from tables and graphs to analyze and hypothesize about the changes in medical care in our society.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

1. Individual students or the entire class might collect cause of death and age of death data for their families. If the class does this a class average for great-great grandparent, great grandparent, grandparents, etc. might be compiled. Does this data reflect the same trend shown in U.S. Census data? Develop a from to help students record this data.
2. A student might compile a time line of significant medical discoveries since 1875.
3. A student might gather data from one or more local hospitals focusing upon the use of new procedures and equipment during the last 25 years. This could include information about costs, personnel required to operate it, maintenance costs, and usage.
4. Students might offer reports on interesting medical discoveries.
5. Students might interview a local doctor or nurse about how she/he has been influenced by new medical technology, or they might ask her/him to explain why some causes of death have declined while others have increased.
6. A local doctor, nurse, or school doctor or nurse might be invited to discuss the above issues with the class.

MEDICAL TECHNOLOGY IN THE LATE 19TH CENTURY

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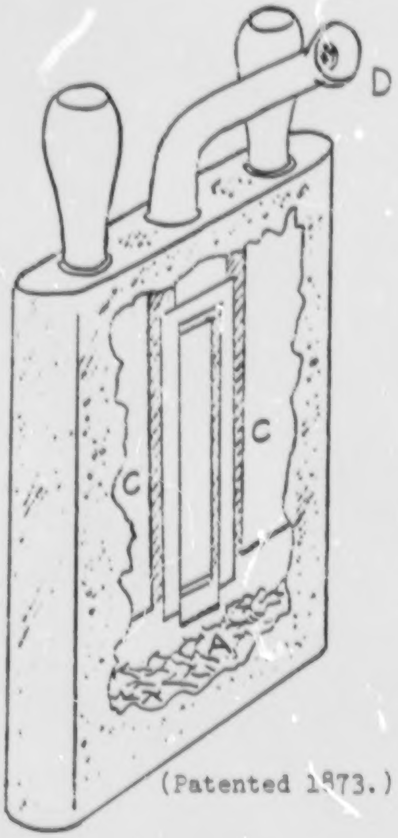

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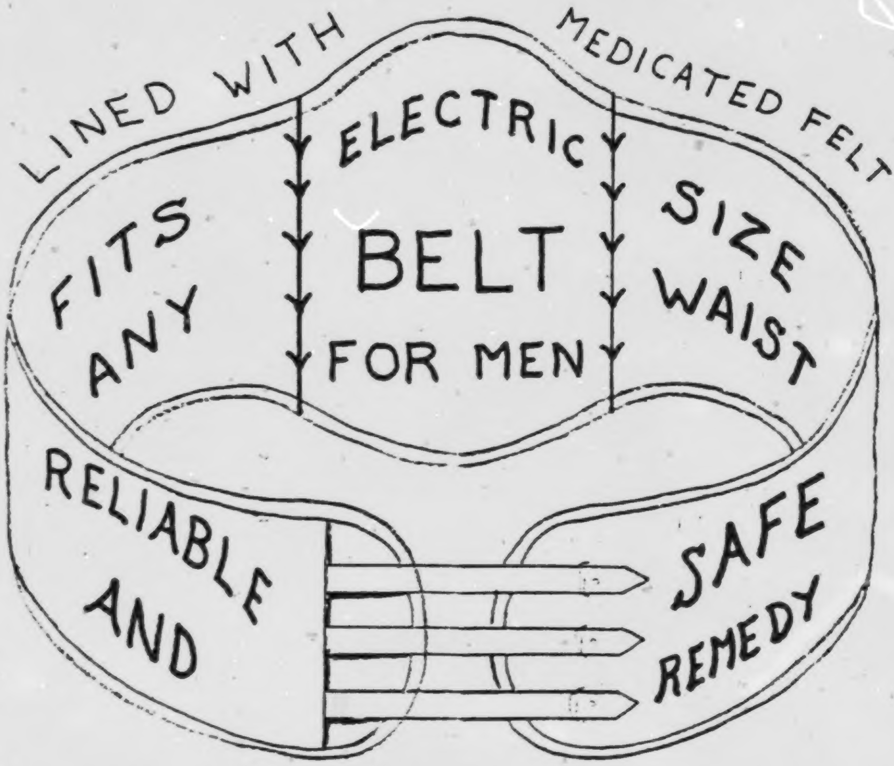

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ADVANCES IN MEDICAL TECHNOLOGY: READING A TABLE

Listed below are som questions to guide you in looking at the information included in the following tables. Remember these points about reading tables as you answer the questions:

1. Title. A good title should state precesely what information is contained in the table. A title such as "U.S. Life Expectancy at Birth: 1900-1971" is more helpful than "Life Expectancy".

2. Source. Every table should identify its source of information. "Is the source reliable?" is a question that should always be asked. Does the source report how and when the data presented in the table was gathered? If we don't know how and when data was collected then it may be difficult to judge how reliable the data is.

3. Footnotes. Footnotes supply additional information which you may need to know to read the table accurately.

4. Column and Row Headings. The headings provide additional detail on the type of information presented in the table. In Table A the headings clearly show that life expectancy is reported for black and white males and females and for all males and females.

5. Units of Measure. Tables are often misread because people do not identify the kind of information being reported. In Table A the unit of measure is years. Some other units of measure might have been months or days.

6. Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending upon the task at hand, the reader might wish to look for variability between males and females, between blacks and whites, or some combination of these.

QUESTIONS

Use Table A

1. Who had the shortest life expectancy?____________________________

____

2. If you were a Balck female born between 1959 and 1961, what was your life expectancy at birth? ____________________

____

3. If you were a white male born in 1969, on the average, how much longer could you expect to live than a Black male born in the same year? ____________________

____

Use Table B

4. 194.4 after tuberculosis and 1900 refers to what? __________

____

5. What disease killed 158.9 persons per 100,000 in the U.S. in 1910? ____________________

____

6. What was the second most common cause of deaht in the U.S. in 1900? ____________________

____

7. Between 1900 and 1975 which killer disease decreased the most as a killer? ____________________

____

8. Between 1940 and 1950 which disease increased the most as a likely killer? ____________________

____

Use Table C

9. What was the difference in labor costs per patient day between 1970 and 1975? ____________________

____

10. From 1960 through 1970 what was the increase in employees per patient day? ____________________

____

11. Did nonlabor costs increase more rapidly from 1955-1960 or from 1970-1975? ____________________

____

11. Did nonlabor costs increase more rapidly from 1955-1960 or from 1970-1975? ______________________________

____

12. From 1970-1975 which increased more rapidly, labor costs or nonlabor costs? ______________________________

____

U.S. LIFE EXPECTANCY AT BIRTH
1900-1971

TABLE A

Average lifetime in years and excess in years over previous period, by race and sex: Death-Registration States, 1900-1902 to 1919-1921, and United States, 1929-1931 to 1969-1971.

Period	Total		White		Black	
	Male	Female	Male	Female	Male	Female
	Average lifetime					
1969-1971---------------	67.04	74.64	67.94	75.49	60.00	68.32
1959-1961---------------	66.80	73.24	67.55	74.19	[1]61.48	[1]66.47
1949-1951---------------	65.47	70.96	66.31	72.03	[1]58.91	[1]62.70
1939-1941---------------	61.60	65.89	62.81	67.29	52.26	55.56
1929-1931---------------	[2]57.8	[2]61.1	59.12	62.67	47.55	49.51
1919-1921---------------	[2]55.7	[2]57.5	56.34	58.53	47.14	46.92
1909-1911---------------	49.86	53.24	50.23	53.62	34.05	37.67
1900-1902---------------	47.88	50.70	48.23	51.08	32.54	35.04
	Excess over previous period					
1969-1971 over 1959-1961	0.24	1.40	0.39	1.30	[3]-1.48	[3]1.85
1959-1961 over 1949-1951	1.33	2.28	1.24	2.16	[3]2.57	[3]3.77
1949-1951 over 1939-1941	3.87	5.07	3.50	4.74	[3]6.65	[3]7.14
1939-1941 over 1929-1931	[3]3.8	[3]4.8	3.69	4.62	4.71	6.05
1929-1931 over 1919-1921	[3]2.1	[3]3.6	2.78	4.14	0.41	2.59
1919-1921 over 1909-1911	[3]5.8	[3]4.3	6.11	4.91	13.09	9.25
1909-1911 over 1900-1902	1.98	2.54	2.00	2.54	1.51	2.63

[1] For all races other than white. Value for Blacks not available.

[2] Approximated by taking the average of the values for the 3 years as given in table 5-5 of Volume II of Vital Statistics of the United States, 1973.

[3] Approximated (see footnote 2).

Department of Health Education and Welfare, Some Trends and Comparisons of United States Life Table Data: 1900-1971. Volume 1 and 4 (Rockville Md: Dept. of HEW., 1975), p. 4-8.

TABLE B

SELECTED MAJOR CAUSES OF DEATH 1900-1975 IN THE U.S.*

	1900	1910	1920	1930	1940	1950	1960	1970	1975
Tuberculosis	194.4	153.8	113.1	71.1	45.9	22.5	6.1	2.6	1.8§
Influenza & Pneumonia	179.3	109.9	152.7	102.	71.3	31.3	37.3	30.9	27.0
Typhoid & Paratyphoid	31.3	22.5	7.6	4.8	1.1	.1	.0	.0	.0
Cerebrovascular Diseases (strokes)	72.5	76.0	80.9	80.5	79.9	104.0	108.0	101.9	91.8
Diphtheria	40.3	21.1	15.3	4.9	1.1	.3	.0	.0	.0§
Whooping Cough	12.2	11.6	12.5	4.8	2.2	.7	.1	.0	.0§
Measles	13.3	12.4	8.8	3.2	.5	.3	.2	.0	.0§
Cancer	64.0	76.2	83.4	97.2	120.3	139.8	149.2	162.8	174.4
Heart Disease	137.4	158.9	159.6	214.2	292.5	510.8	521.8	496.	339.0
Cirrhosis of the liver	12.5	13.3	7.1	7.2	8.6	9.2	11.3	15.5	15.1
Diabetes Mellitus	11.0	15.3	16.1	19.1	26.6	16.2	16.7	18.9	16.8
Arteriosclerosis	5.1†	21.3†	22.9†	18.5	17.3	20.4	20.0	15.6	13.7

*Per 100,000 of the population.
§1973
†All fatal diseases of arterial system.

Forrest Linder & Rovert Grove, Vital Statistics Rates in the United States 1900-1940. United States Dept. of Commerce Washington 1943, pp. 330-331.

Robert Grove & Alice Hetzel, Vital Statistics - 1940-1960 Washington, D.C.:, U.S. Department of Health, Education and Welfare 1968.

Health United States 1975 (Washington, D.C.: Department of Health, Education and Welfare, 1976).

TABLE C

Input Prices and Real Inputs per Patient Day

	1955	1960	1963	1966	1969	1970	1971	1972	1973	1974	1975
Total Expended for Health Research (millions of $)	-	592	-	-	1,790	-	-	-	-	2,684	-
Labor cost per patient day ($)	14.26	20.08	24.01	29.41	41.85	47.61	54.13	59.71	64.08	69.57	80.39
Full-time equivalent employees per patient day	2.03	2.26	2.41	2.61	2.80	2.92	3.01	3.10	3.15	3.26	3.39
Nonlabor cost per patient day ($)	8.86	12.15	14.90	18.74	28.18	33.40	38.18	45.50	50.61	58.54	71.14

Definition of terms:

Labor cost per patient day — total salary and wage cost for one patient for one day of care.

Full-time equivalent employees per patient day — number of medical employees for each patient for one day.

Nonlabor cost per patient day — all costs minus salary and wages per patient per day.

Source: The Rapid Rise of Hospital Costs, Executive Office of the President Council on Wage and Price Stability, 1977.

MEDICAL TECHNOLOGY

Americans have been living through a technological revolution. In the home, school, office, factory and hospital and Doctor's office new machines and methods are used. During the last century applied scientific research has produced a multitude of inventions. The automobile, airplanes, electricity, and nuclear energy have revolutionized our lives. Medical technology has also been part of this change. Advances in medical technology have occurred in two areas--administration and clinical care.

Administrative changes focus upon data processing. Computers can reduce the cost of care and deliver care more efficiently. They schedule admissions, keep records, analyze laboratory results, and perform many other tasks which used to be done by hand.

Not only has administrative technology changed, but clinical technology has also advanced. New vaccines have reduced the number of cases of dreaded killers of the past. Scientific research has produced new miracle drugs and sophisticated equipment costing millions of dollars. New equipment and procedures require carefully trained medical technologists to operate them, and operating costs are often very high. Research in one field, such as space exploration, often produces new materials or procedures which can be applied in medical areas. New monitoring and scanning devices allow doctors to make tests quickly and to diagnose diseases more accurately. Scanners allow doctors to take pictures of soft tissue, not just X-rays of bones. This reduces the need for exploratory surgery. Disposable items such as hypodermic needles, scalpels, and surgical gowns reduce the risk of infection. Expensive new equipment provides better care for victims of heart attacks. Artificial kidneys, limbs, heart parts, transplant techniques, iron lungs, and research to develop numerous other artificial organs indicate the level of sophistication reached by the revolution in medical technology. Depending upon applied scientific research, medical science has progressed far beyond the snake oil cure-all of yesteryear.

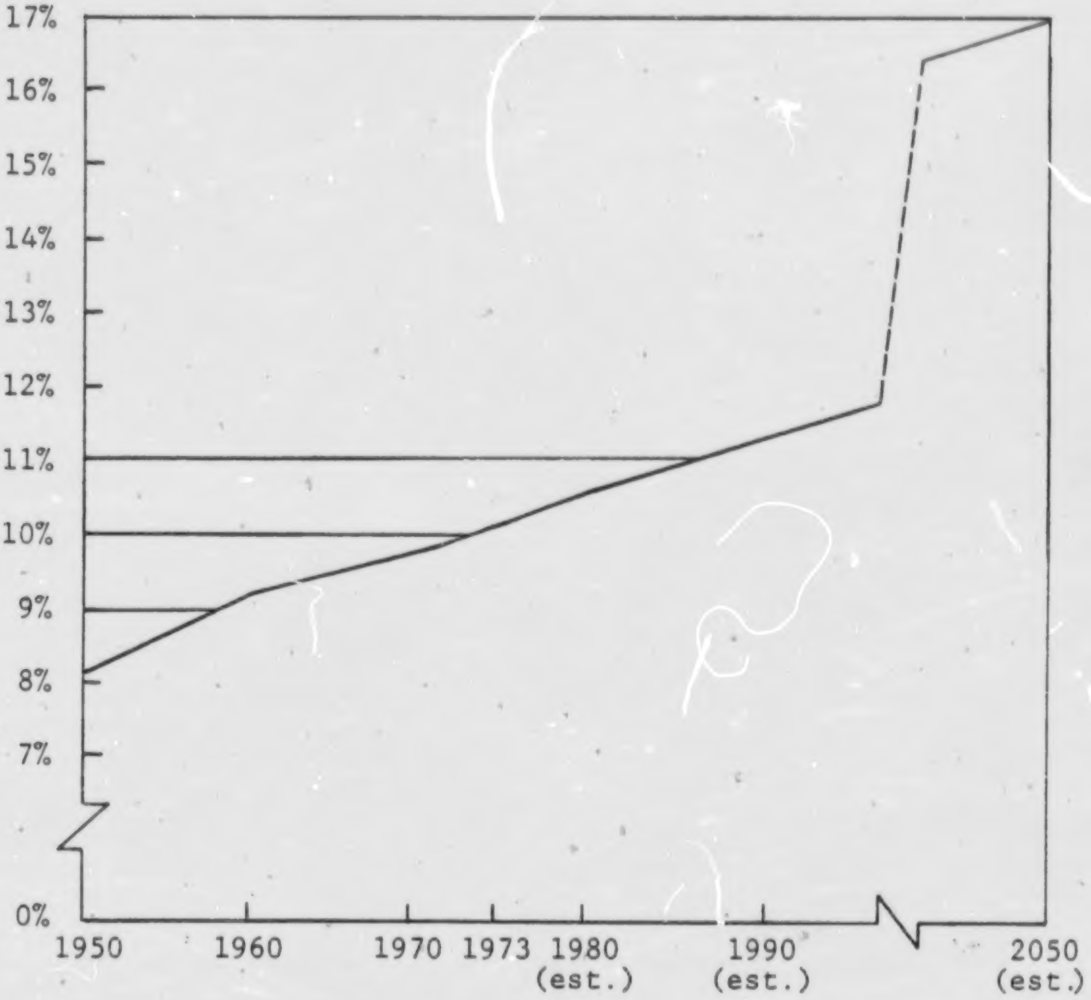
MEDIAN AGE FOR THE UNITED STATES POPULATION

YEAR	MEDIAN AGE
1950	30.2
1960	29.4
1970	27.9
1980*	30.1
1990*	32.6
2000*	35.4
2025*	37.7
2050*	37.8

* estimates

Statistical Abstracts of the United States: 1976
Washington, D.C., pp. 6-7.

PERCENTAGE OF UNITED STATES POPULATION AGED 65 AND OLDER: 1950-1990



Source: U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States: 1974 (Washington, D.C.: U.S. Government Printing Office, 1974), Tables 3, 35. The 1980 and 1990 population projection is the Census Bureau's Projection under Series I-E, which assumes 2,100 births per 1,000 women upon completion of childbearing and continuation of 1960-1970 migration patterns.

Colorado Daily 27 #66
Monday 12/11/78
pp. 3-4

OLDER PEOPLE A GROWING PROBLEM IN GREAT BRITAIN

By Rudolf Klein
International Writers Service

LONDON -- Britain, like other modern industrial countries, is gradually becoming an older society. And the prospect of coping with the elderly poses some difficult and puzzling challenges for future economic and social policies here.

The potential problem comes as something of a surprise, since British demographers were forcasting not so long ago that Britain was facing a population explosion. According to their predictions, the present population of 55 million would rise to 70 million by the end of the century.

But the prophesy is proving wrong. The birthrate has slumped. Meanwhile, people are living longer. So instead of becoming an overcrowded island, Britain will be confronted by an extraordinarily large percentage of the aged.

There are already 9.5 million retired persons in Britain. Not only are their numbers growing, but, with a decline in births, they will form a higher proportion of the total population in the decades ahead. Now, one out of every 104 people here is over the age of 85. Twenty years from now, one out of every [illegible]5 will be an octogenarian.

The economic and social implications of this evolution are clear, since the aged impose a heavy financial burden on the nation.

Old people require expensive care in hospitals, nursing centers or in their own homes. As it is, nearly one-third of all hospital beds under the government's medical service are occupied by persons over the age of 75. It is reckoned, moreover, that health attention for that age bracket costs seven times more than that for people of working age.

If expenditures are going to be increased to provide for more and better services for the aged, therefore the money will have to be raised by higher taxes on the working population. But in Britain, as in the United States, a revolt against taxes is taking shape. The Labor government, in fact, has increasingly been shaving taxes in order to persuade the labor unions to hold down their wage demands.

The situation is aggravated by the fact that the elderly in Britain suffer to a large extent from poverty. Most rely on government pensions that are barely adequate to sustain a basic living standard, even though they have been raised in recent years. Thus pressure is likely to build up for bigger pensions that cover more old people.

Specialists grappling with these dilemmas are discussing a variety of policy options. As usual, none appears to offer an easy answer.

One possibility is to raise the retirement age, which is currently 65 for men and 60 for women. Or, given the clamor these days for sex equality, the retirement age for women could be raised to that of men. This, it is thought, would economize on government pensions.

But this possibility is considered unrealistic in the light of Britain's high unemployment rate. For, by encouraging those in their 60's to continue working, the competition for scarce jobs would be stimulated.

Another possibility that seems to be somewhat more feasible is to strengthen the ability of families and communities to care for the elderly, thereby reducing the drain on the public purse.

Under one program, introduced a few years ago, special allowances are paid to families that look after handicapped members. A proposal now being contemplated would subsidize temporary "hotel" care for these handicapped so that families can enjoy vacations or merely get a respite from their responsibilities.

Yet another possibility is that a continued drop in the birthrate will furnish an opportunity to close schools, close unnecessary maternity wards and switch resources to the elderly.

This is the option preferred by the government, but it is running into snags. Schoolteachers, who belong to a powerful union, argue that a decline in pupils ought to be used to cut the size of classes. Doctors argue that medical funds saved by fewer births ought to be funneled into improved health care.

Complicating this possible approach is the matter of professional commitments. A redundant schoolteacher is not easily turned into a social worker, and an unwanted obstetrician is reluctant to retrain as a geriatrician.

The suggestion has been made that the jobless be mobilized into the social services, to be used among other things to care for the elderly. This proposal is based on the calculation that paying the unemployed to perform these duties would not cost much more than the benefits they receive.

It is a neat idea, particularly if unemployment continues to rise, as seems likely. Still, the question of footing the bill remains unanswered as long as Britain's stagnant economy is unable to generate larger funds for welfare purposes--and as long as the ranks of the elderly continue to expand.

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WARFARE AND TECHNOLOGY

A module for teaching high school students
about the impact of industrial technology upon
the conduct of war with the aid of quantitative concepts.

Project QUESST
Boulder, Colorado
September, 1979

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Supplementary Teacher Materials

1. Munitions Expended Graph (Answer Sheet).

Student Materials

1. Military and Civilian Technology (slides).
2. Department of Defense Casualty Figures.
3. Pounds of Munitions Used Per Acre.
4. The Costs of War.
5. Civilians and War Worksheet.
6. War Cost.
7. List of Nations.
8. Table of Nuclear Blast Damage.

OVERVIEW

Introduction

Since 1945 the human race has lived under the shadow of the mushroom cloud. Nuclear weapons, however, represent only the latest step in a series of innovations that have changed the nature of warfare. Since the American Revolution, wars generally have become more costly, more destructive of property and life, and more dependent upon the role of civilians. As warfare has become more dependent upon industry, the civilians who operate the factories have become almost as important as the combatants in the field. Students through this module examine the role of industrial technology in producing changes in the nature of warfare. After completing this module students should be better able to understand that although technology has brought a higher standard of living, it has also produced the uncertainties of the nuclear age. By using graphs and tables, students explore the correlation between cost, destruction, civilian involvement, and industrialization.

Description of Materials

Courses and Topics:

American History: 20th century wars.

World History: World War I and World War II.

Current Social Problems: International conflict.

Political Science: International relations.

Grade Level: 10-12.

Time Required: 2-3 class periods.

Concepts and Skills:

Social Science Concepts: Military technology and civilian industrial technology.

Quantitative Concepts: Graphs and tables.

Thinking Skills: Comparing, interpreting, and hypothesizing.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Use data from graphs and tables to formulate hypotheses about the impact of industrial technology upon the conduct of warfare.
2. Test the hypothesis that warfare has become more costly, more destructive, and more dependent upon industrial technology.
3. Explain the increasing tendency of warfare to involve the civilian as well as the military sectors of warring nations.

Sources of Data:

M.A. Bressler and L.A. Bressler, Peace or War, Inquiry into Crucial American Problem Series, ed. Jack Fraenkel (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1977); Department of Defense, Selected Manpower Statistics (Washington, D.C.: OASD, Comptroller, Directorate for Management Information, 1977); R.E. Dupuy and T.N. Dupuy, The Encyclopedia of Military History, 3500 BC to the Present (New York: Harper and Row, 1970); Samuel Glasstone, ed., The Effects of Nuclear Weapons (Washington, D.C.: U.S. Atomic Energy Commission, 1962); John McHale, World Facts and Trends (New York: Macmillian, 1972); Joseph Moore and Roberta Moore, War and War Prevention (Rochelle Park, N.J.: Hayden Book Co., Inc., 1974); Stockholm International Peach Research Institute, World Armaments and Disarmament: SIPRI Yearbook 1978 (New York: Crane, Russak & Co. Inc., 1978), David Wallechinsky, Irving Wallace, & Amy Wallace, The Book of Lists (New York: William Morrow & Co., Inc., 1977).

Committee on Atomic Energy was the source of information about which nations have a nuclear capacity and which ones can acquire a nuclear capacity in the next ten years. Joseph Moore and Roberta Moore, War and War Prevention, was the source of data about Russian and American nuclear weapon size and destructive power. The Atomic Energy Commission provided data about the radiation blast effects of a nuclear explosion.

LESSON 1: THE CHANGING NATURE OF WARFARE

Introducing the Lesson

1. Introduce this lesson through the following four steps. Project the slides of Military and Civilian Technology (Student Materials #1), and a blank time line from 1776 to 1978. Ask students to place both military and civilian inventions on the time line at the date they think is appropriate. After students complete their time lines, discuss the order of items and reasons for their placement.

2. Using students' responses from the above discussion, construct a correct time line on the black board or overhead transparency. The following dates may act as a guide to constructing your timeline:

Radar - In 1934 the U.S. Navy made the first successful test of radar.

Television - The first home television receiver was demonstrated in 1928.

Typewriter - In 1867 Christopher Sholes patented his typewriter; however, other typewriters had been developed before this date.

Automobile - The auto was "invented" by a number of different people--Daimler, Benz, Olds, Ford, and others--between 1885 and 1905.

Rocket - The first successful liquid propelled rocket was tested in 1926 by Robert Goddard.

Electric Light Bulb - Edison developed the incandescent bulb in 1880.

Machine Gun - Gatling patented the forerunner of the machine gun in 1862.

Jet Passenger Airplane - The English DeHavilland Comet became the first commercial jet airliner in 1949.

Tank - In 1916 the British first used tanks in a war.

Atomic Bomb - The first humanly initiated nuclear reaction was in 1942.

Airplane - The Wright Brothers are generally credited with the first powered flight in 1903.

Military Airplane - In 1910 Glenn Curtiss used an airplane to drop a bomb on a target. This seems to have been the first military use of aircraft.

3. Ask students to examine the correct time line and respond to the following questions:

--Do you see any patterns of development in civilian goods? Yes, they become more sophisticated and increasingly require industrial technology in order to be produced.

--Do you see any pattern in the development of military weapons? Yes, they become more sophisticated and increasingly require industrial technology in order to be produced.

--Do you think military technology and civilian technology are related? If so, in what ways? Civilian and military technology are closely associated. Frequently, government funds are used to develop some new technological form, and later that technology is applied to civilian purposes. Jet aircraft are a good example of this. On the other hand, new technology may originate for civilian use and then be adapted to military use; for example, the development of the automobile helped produce the technology needed for tanks.

--How do you think the development of new weapons has changed the nature of warfare since the American Revolution? Possible hypotheses are: more destructive, more deadly, more costly, more people involved. Make a list of these changes on the board or an overhead transparency and keep it for future reference.

Developing the Lesson

4. Distribute the Casualty Table for America's Major Wars (Student Materials #2) and have students rank order from highest to lowest the wars in terms of the number of battle deaths. Then, ask students:

--What war had the smallest number of American battle deaths? Spanish American.

--What war had the second smallest number of American battle deaths? The Mexican war.

--What war had the third smallest number of American battle deaths? The War of 1812.

--What war had the highest number of American battle deaths? World War II.

--What war had the second highest number of American battle deaths? Civil War.

--What American wars tended to have higher casualties, those of the twentieth, nineteenth, or eighteeth centuries? Twentieth.

--What American war seems to be a noticeable exception to the trend that recent wars have been more deadly? The Civil War. This war saw the introduction of many technological innovations such as aerial surveillance, gatling guns, breech loading rifles, rifled cannons, iron warships, and repeating rifles. In many cases, the leaders continued to use tactics which were inappropriate in the face of these new weapons. In addition, the war lasted for four years of fierce fighting.

--Can you use any of the information from activity I to explain the trend(s) you identified by rank ordering the wars? Yes, industry produces more sophisticated and deadly weapons, and these contribute to higher casualties.

--In addition to new weapons, what are some other factors which might account for high numbers of casualties? Many factors including length of the war, numbers of troops involved, and geographical factors.

5. Distribute the tables about amount of munitions expended per enemy killed and munitions expended per acre (Student Materials #3) and have students translate these data into two line graphs. See Teacher Supplemental Materials #1 (Answer Sheet).

--What trends can you identify from these graphs? Wars increasingly expend more explosive power.

--Does this additional information support or contradict previous hypotheses about the changing number of casualties? It supports them.

6. Have students examine the Civilian Casualties Graph and Tables (Student Materials #4).

 --What trends can you identify? There are proportionally civilian casualties in more recent wars. Why might more civilians be killed in recent wars than in previous ones? There are many possible explanations, including more powerful weapons, more civilians present, more pounds of explosives used, less selective weapons, and the role of civilians in a modern industrial war economy.

 NOTE: Students may have difficulty answering this question unless they have some basic knowledge of the way wars were conducted before the Twentieth Century. The teacher, therefore, might ask students to describe what a battle during the Revolutionary War might have been like. It is important to stress that very few troops were involved, probably fewer than 100,000 in the entire American Army. at any given time; that although the firing lines may have only been 50 yards apart very few soldiers were wounded because the weapons were not accurate; that huge factories were not needed to meet the needs of the troops in the field; and that civilians were not usually considered to be military targets. Students may have difficulty identifying the role of civilians modern military effort. If they are unable to identify it, ask them to examine some of the recent items on the time line. What do you need to produce these types of objects? Obviously, you need many things including money, raw materials, people, transportation facilities, etc. In short, you need a modern industrial economy.

7. Distribute "Civilians and War Worksheet" (Student Materials #5). Divide the class into groups of 4-6 students who will work together to answer the questions. After the groups have completed the worksheet discuss the answers.

 --What would have happened if all of the factory workers during World War II had gone on strike at the same time and not returned to work for three years? One of the primary results would have been a lack of supplies for troops, and eventually, an inability of the military to continue fighting.

--Based upon the above reasoning, how important are workers to a modern war effort? Very. Why? They provide the objects needed by the military.

--What clues about why civilian casualties have increased are provided by your answers to the last two questions? Civilians are essential to producing the weapons and supplies for the soldiers. Civilians have become targets. Weapons are less discriminating. That is they destroy large areas in order to destroy a much smaller target.

--Why might a country want to kill the workers and destroy the factories of an enemy? To stop their war effort.

--Were the civilians as important to maintaining the war effort during the Revolution as during World War II? Why or why not? Probably not, since revolutionary war troops could forage for food and required a relatively low level of productivity to keep them supplied with weaponry.

8. During previous activities students should have suggested that war has become more destructive, more costly, and more damaging in its impact upon civilians. All of these changes are directly related to the development of industrial economies.

--How might increased industrial development influence the costs of war? War cost would be higher because of greater cost for weapons, and the increased destructive capability of weapons.

NOTE: If students have trouble answering this question have them compare the weapons earlier on the time line with those later. Consider which are more complicated and, therefore, more costly and which are more destructive.

--What factors might effect the cost of a war? Many factors, including length, number of troops, destructiveness of weapons, location, number of fronts.

9. Provide students with copies of the War Cost Table (Student Materials #6).

--Does it support or contradict their hypotheses about the impact of industrial technology upon the cost of war? Supports.

--What might be considered if you are computing the cost of a war? Military goods purchased, working time lost, machinery and land destroyed, veterans benefits, interest on war debt, widows and orphans payments, etc.

--What does the complexity of figuring these costs suggest about any statistics on the topic? Attempts to describe the cost of a war may be very inaccurate.

Concluding the Lesson

10. Ask students to identify and explain three major ways industrial technology has changed the nature of war. War has become more costly, destructive, and dependent upon the industrial production of a civilian work force.

LESSON 2. NUCLEAR WEAPONS

Introducing the Lesson

1. Provide students with the list of nations (Student Materials #7), and ask which ones can destroy the world through the use of nuclear weapons right now (students should indicate these nations with an X), and which ones could develop the ability to destroy the world within 10 years (students should indicate these nations with an O). (X's are People's Republic of China, France, India, United Kingdom, U.S.S.R. and the U.S. all of the rest are O's.)

NOTE: Destroy the world may be defined to mean the ability to kill a majority of the humans who live on this planet.

2. Discuss students' response to this exercise.

--Were they surprised? Why?

--What are the implications of this situation? Obviously, nuclear weapons are a threat to world safety.

--Why is an arms agreement only between the U.S. and U.S.S.R. of limited value? Other countries have nuclear weapons.

--Several years ago a college student in the U.S. revealed his blue prints for building a nuclear bomb. When they were examined, the Atomic Energy Commission agreed that the bomb would work. Does the availability of nuclear knowledge present any dangers? Explain. Yes. As more people and nations gain nuclear capability the probability of someone using it increases.

--As more and more countries acquire nuclear power, what is the probability of someone miscalculating and using these weapons? It increases.

--Is it more or less likely that sometime in the future terrorists or a disturbed leader such as Adolf Hitler may acquire nuclear weapons? More.

--Consider your answers to the 3 previous questions. Does the spread of nuclear weapons pose any problems? If so, what might be done to solve the problem? Countries with nuclear power might agree not to help anyone else develop nuclear weapons. They also might agree to stop such development by force, if necessary. Nonnuclear countries might be rewarded with food or nonnuclear technology if they agree not to construct nuclear weapons.

Developing the Lesson

3. The previous lesson indicated that wars have (over time) increasingly employed more total destructive power. Although they have only been used twice, nuclear weapons add an entirely new dimension to warfare. Have students examine the table comparing the blast damage of WWII atomic bombs with more modern thermonuclear weapons (Student Materials #7, p. 2).

NOTE: Before asking students to analyze Student Materials #8, the teacher should discuss definitions of terms in those materials which the teacher feels the students may not know. Vertebras, ecological imbalance, genetic damage, economic collapse, mass hysteria, psychological damage, political dictatorship.

thermal radiation - the process through which heat spreads from one place to another.

nuclear radiation - the diffusion of energized parts of atoms.

fission - the process of splitting atoms.

fusion - the process of joining atoms together.

--What conclusions might be drawn? Today's weapons are immensely more powerful. Now examine the table, figure, and data sheet about the destructiveness of nuclear weapons (Student Materials #8, pages 1-4).

--As nuclear weapons become more powerful what happens to their impact? They are so destructive that it is difficult to imagine. One bomb could destroy an area almost as large as New England.

--What conclusions might be drawn? Today's weapons are immensely more powerful. Now examine the table, figure, and data sheet about the destructiveness of nuclear weapons (Student Materials #8, pages 1-4).

--How does the power of modern nuclear weapons compare with the power of weapons used in previous wars? They are enormously more powerful. One weapon has more power than that used in all wars in previous history.

--What are some implications of using nuclear weapons? These are numerous including massive destruction of life and property, long term radiation damage, and no winners--just losers by most rational standards.

--What predictions might you make about how major wars will be fought in the future? More destructive, more dependent upon advanced technology, more cost, more casualties.

--Do wars fought with intercontinental ballistic missiles (ICBMs) make it easier to become impersonal about killing residents of a city in another country? Why or why not? Yes. It is easier because there is not personal contact between enemies.

--What might be the implications of this situation? It could result in increased readiness to use weapons which can annihilate millions.

Concluding the Lesson

4. Ask students to assume that they are President Truman during the closing days of World War II. Germany has been defeated, but Japan fights on stubbornly. President Truman is trying to decide whether or not he should order the atomic bombing of Japan. Although Japan has been severely damaged by the war, its navy and air force practically destroyed, the army still has 5,000,000 men under arms. American intelligence estimates that it will cost 500,000 American soldiers their lives to invade Japan. They also estimate that well over 1,000,000 Japanese would lose their lives. However there are signs that Japan cannot hold out much longer and is considering opening peace talks. Truman considers using one

bomb as a test in an unpopulated area of Japan to demonstrate its power, but he knows that it might not work. He also knows that we have only two bombs and it would take months to make more. Can he afford to waste one in a demonstration? President Truman also considers what the rest of the world would think of us if we would use such a horrible weapon. If we use it, other countries might develop one sometime and use it against us. He thinks of all of the people it would kill. However, he also remembers Pearl Harbor and the American troops killed by the Japanese attack. What do you think you should do if you were President Truman?

5. Ask students to identify the factors that President Truman is considering. Ask students to consider both the evidence that President Truman has and what they know about the destructiveness of nuclear weapons to decide what they should do, and select the best reason for doing that. Have students who advocate the same course of action form groups of 4 or 5 members and select the best reason for doing what they suggest.

6. Hold a general class discussion in which each group shares its best reason. Stress that this is not a debate and students should feel free to change both the action they recommend and the reasons supporting it.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in this module.

This module has examined the relationship between industrialization and the nature of war. Careful examination of TABLES and GRAPHS helped students to HYPOTHESIZE about the relationship between industrialization and the cost of war, total destructiveness of weapons used, and military and civilian casualties.

Students recognize that technological development of military weapons has made wars more costly, destructive, and dependent upon industrial technology and civilians who maintain that technology.

The final section of the module examined the impact of nuclear weapons upon the conduct of war and asked students to consider whether nuclear weapons represent a break with the past or are simply the latest development in a long trend which links industrial technology to weaponry.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of this module.

1. Have students do a structured book report on books dealing with warfare. Aspects of the report might focus upon the impact of war upon the human character, the influence of war upon combatants and civilians, the losses caused by wars, the risks of accidental war, the view of front-line troops compared to leaders and civilians, or feelings toward the enemy.

2. Have students do structured interviews with veterans from different wars and compare their perceptions. Interview questions might include:

   --What was your most memorable event of the war?

   --Why did you join the military and how did you feel about fighting?

   --What kinds of equipment did you have?

   --How did the quality of American weapons compare with the enemy's?

   --Did the quality and quantity of our weapons play an important role in the conduct of the war?

   --How do you think a war today would differ from the one you fought?

   --How did the war influence those who fought it? Did any of your ideas or feelings change as a result of being involved in the war?

3. Invite a career service person to discuss how weapons have changed while they have been in the military. You might pose the following questions:

   --What would happen to our military power if our industry halted production?

   --Have there been any changes in the firepower available to the common infantryman?

--How complicated are most of today's weapons systems? Do you need special technical training to service and operate them?

--How long does it take to develop a new weapons system? Why does it take that long?

--Does it cost more to train a soldier now compared to 20 years ago? Why or why not?

--How important is scientific research to the military?

4. Have students examine the Time-Life series, This Fabulous Century, locate pictures of weapons in action, and estimate their destructive capacity. What trends appear? What might be some implications of this trend?

5. Distribute data about defense contract awards and payrolls found in U.S. Statistical Abstracts. Ask:

--What was the amount for Defense contracts in your state for each of the last three years? Do these amounts represent an increase or decrease?

--Choose two states bordering your state. What are their amounts for defense contracts last year? How do they compare to your state?

--Last year, what state had the largest amount for defense contracts?

--Last year, what state had the smallest amount for defense contracts? (Not including Montana's cancelled ABM site construction.)

--What would the impact be if your state lost these defense contracts?

--Based on your collected information, what roles does the military play in the economy of your state? How might cuts in the military budget affect your state? Your community? What affect does the military have on the social or cultural life in your state? Your community?

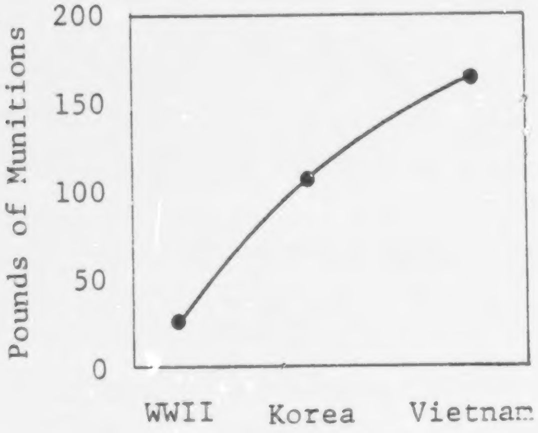
POUNDS OF MUNITION USED PER ACRE *

World War II	22.44
Korea	105.6
Vietnam	167.2

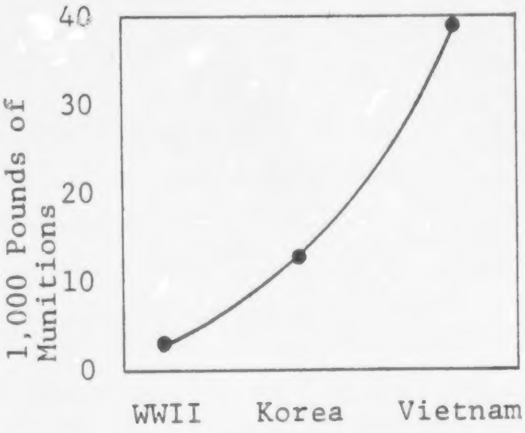
POUNDS OF MUNITIONS USED PER ENEMY SOLDIER KILLED

World War II	2,420
Korea	12,320
Vietnam	39,160

Pounds of Munitions Per Acre



Pounds of Munitions Per Enemy Soldier Killed



* The area of the official theater of military operation is used to figure acres.

Source: Stockholm International Peace Research Institute, World Armaments and Disarmament: SIPRI Yearbook 1978.

DEPARTMENT OF DEFENSE CASUALTY FIGURES

PRINCIPAL WARS AND CONFLICTS IN WHICH THE UNITED STATES PARTICIPATED

U.S. MILITARY PERSONNEL SERVING AND CASUALTIES

WARS	NUMBER SERVING	CASUALTIES		
		Battle Deaths	Other Deaths	Wounds not Mortal
Revolutionary War 1775-1783	184,000 - 250,000	4,435	?	6,188
War of 1812 1812-1815	286,730	2,260	?	4,505
Mexican War 1846-1848	78,718	1,733	?	4,152
Civil War (Union Forces only) 1861-1865	2,213,363	140,414	224,097	281,881
Spanish-American War 1898	306,760	385	2,061	1,662
World War I (6 April 1917-11 Nov. 1918)	4,734,991	53,402	63,114	204,002
World War II (7 Dec. 1941-31 Dec. 1946)	16,112,566	291,557	113,842	670,846
Korean Conflict (25 June 1950-27 July 1953)	5,720,000	33,629	20,617	103,284
Vietnam Conflict (4 Aug. 1964-27 Jan. 1973)	8,744,000	45,941	10,303	153,303

Source: Selected Manpower Statistics, Department of Defense.

POUNDS OF MUNITIONS USED PER ACRE *

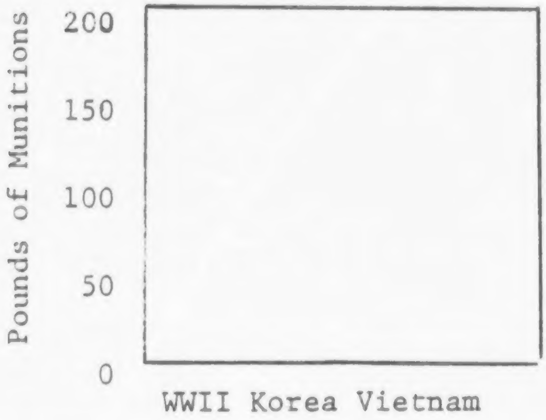
World War II	22.44
Korea	105.6
Vietnam	167.2

POUNDS OF MUNITIONS USED PER ENEMY SOLDIER KILLED

World War II	2,420
Korea	12,320
Vietnam	39,160

Source: Stockholm International Peace Research Institute
World Armaments and Disarmament: SIPRI Yearbook 1978.

Pounds of Munitions
Per Acre



Pounds of Munitions
Per Enemy Soldier Killed

Source: The area of the official theater of military operations is used to figure acres.

THE COSTS OF WAR

World War I

Nations	Civilian Dead
Allies	
France	40,000
British Empire	30,633
Russia	2,000,000
Italy	
United States	
Belgium	30,000
Serbia	650,000
Montenegro	c/
Rumania	275,000
Greece	132,000
Portugal	
Japan	
Total	3,157,633
Central Powers	
Germany	760,000
Austria-Hungary	300,000
Turkey	2,150,000
Bulgaria	275,000
Total	3,485,000
Grand Total	6,642,633

THE COSTS OF WAR

World War II

Nations	Civilian Dead
United States	Negligible
United Kingdom	65,000
France	108,000
Soviet Union	10-15,000,000
China	1,000,000
Germany	500,000
Italy	40-100,000
Japan	300,000
All other participants	14-17,000,000
Total	26-34,000,000

Source: R. E. Dupuy and T. H. Dupuy, The Encyclopedia of Military History 3500 BC to the Present.

PERCENT OF CIVILIAN WAR DEATHS
OF TOTAL WAR DEATHS

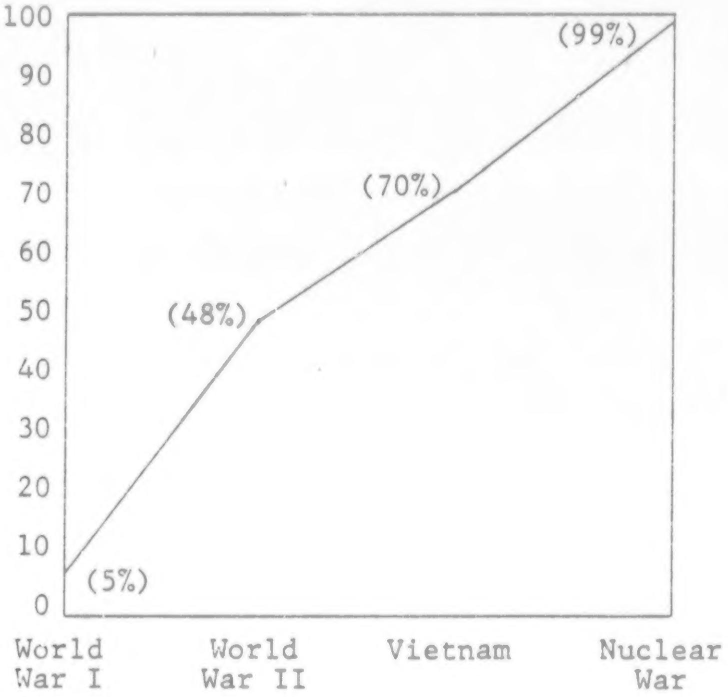
The numbers of civilians killed in any war is at best a rough estimate.

This is especially true in Vietnam because of the nature of the warfare. Bombing from the air and artillery fire from many miles away mean a heavy civilian toll.

By early 1971, the tonnage of bombs dropped in Vietnam was 2½ times that dropped by both sides in all theaters in World War II.

It is estimated that 1.5 million persons have died in Indochina in 10 years of war, of which the great majority are civilians.

Minimal estimates of U.S. deaths from a Soviet first-strike nuclear attack are put at 50 million persons, of which only a small percent would be military personnel.



Source: John McHale, World Facts and Trends.

Civilians and War Worksheet

The questions below are designed to help you discover some reasons why civilian casualties have climbed so dramatically during the Twentieth Century. Discuss each of the questions in your group and record all of the ideas which you think might help to answer the question.

1. What would have happened if all of the factory workers during World War II had gone on strike at the same time and not returned to work for three years?

   ____

   ____

   ____

2. Based upon your answer to the above question, how important are workers to a modern war effort? Why?

   ____

   ____

   ____

3. What clues about why civilian casualties have increased are provided by your answers to the last two questions?

   ____

   ____

   ____

4. Why might a country want to kill the workers and destroy the factories of an enemy?

   ____

   ____

   ____

5. Were the civilians as important to maintaining the war effort during the Revolution as during World War II? Why or why not?

____

____

____

WAR COST

The Price of America's Nine Major Wars

It is of course impossible to calculate the full cost of wars. We can only guess at their immediate and lasting effects upon the lives and spirits of both combatants and civilians. But the price paid for wars in terms of humans killed and wounded and the cost in dollars, which can be tabulated with fair accuracy, is appalling, as these figures indicate.

Estimated Ultimate Cost of Nine American Wars
(by Rank Order)

World War II	$664,000,000,000
Vietnam Conflict	332,000,000,000
Korean Conflict	164,000,000,000
Civil War (Union only)	12,952,000,000
Spanish American War	6,460,000,000
American Revolution	190,000,000
War of 1812	158,000,000
Mexican War	147,000,000

Source: M. A. Bressler and L. A. Bressler, Peace or War: Can Humanity Make the Choice?

LIST OF NATIONS

1. Argentina
2. Austria
3. Belgium
4. Brazil
5. Canada
6. Czechoslovakia
7. Denmark
8. East Germany
9. Egypt
10. Finland
11. France
12. India
13. Iran
14. Israel
15. Italy
16. Japan
17. Mexico
18. Netherlands
19. Norway
20. Pakistan
21. People's Republic of China
22. Poland
23. Portugal
24. Republic of China (Taiwan)
25. Romania
26. South Africa
27. South Korea
28. Spain
29. Sweden
30. Switzerland
31. United Kingdom
32. U.S.S.R.
33. United States
34. Turkey
35. Yugoslavia

Source: U.S. Congress, Joint Committee on Atomic Energy.

THE GROWTH OF NUCLEAR WEAPONS POWER

	kt*/mt**	Explosive power in tons of TNT
World War II	20 kt.	20,000
1978 Strategic Bomber	20 mt.	20,000,000
1978 MARV ICBM Missile***	200 kt.	200,000
1978 Biggest Soviet Bomb	58 mt.	58,000,000

* kt = Kiloton or the equivalent of 100 tons of TNT

** Mt = Megaton or the equivalent of 1,000,000 tons of TNT

*** Each missile carries 7-14 separate explosive packages. These figures describe only 1 of these packages.

Sources: World Armaments and Disarmament: SIPRI Yearbook 1978, and Joseph Moore and Roberta Moore, War and War Prevention.

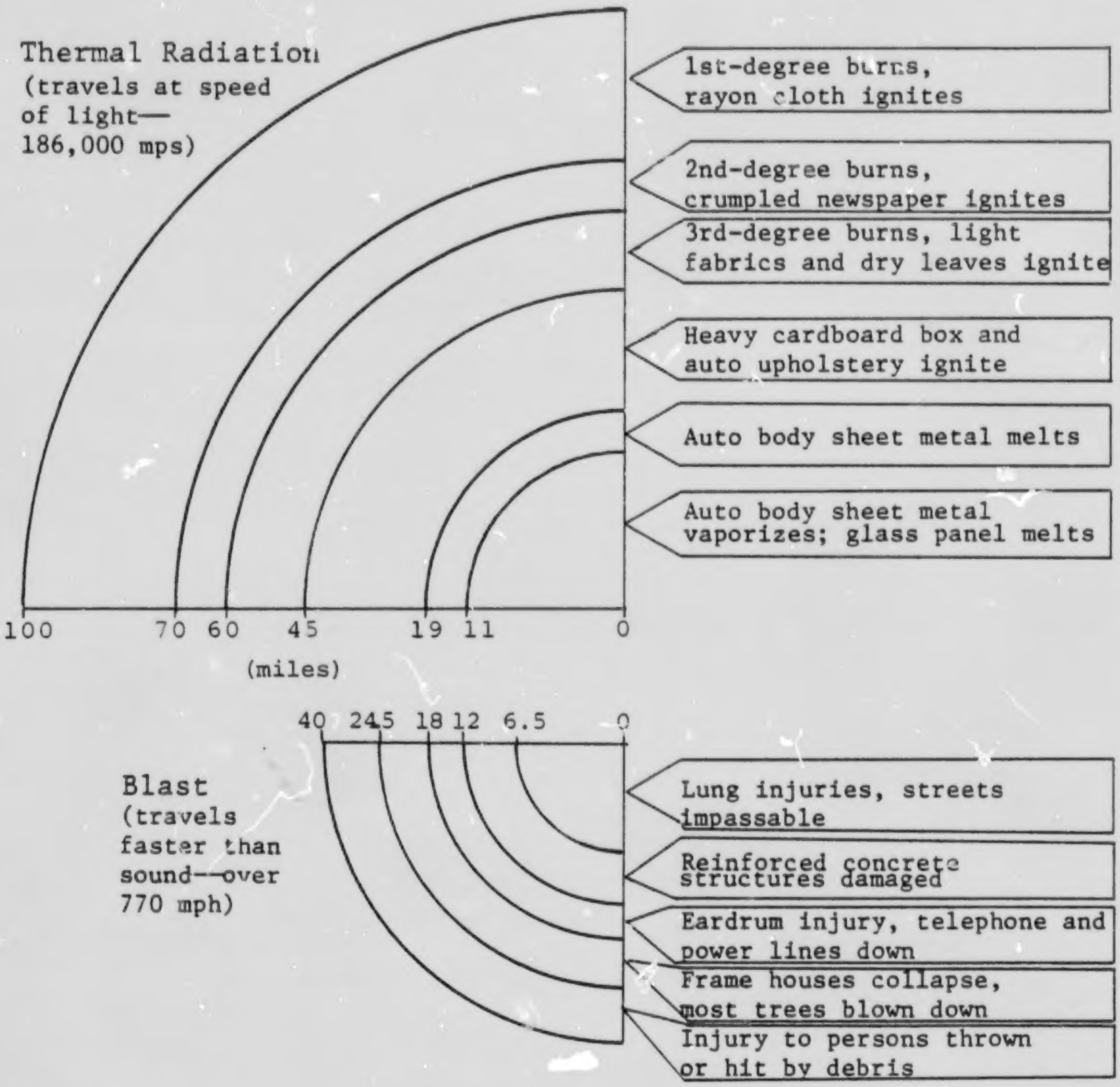
TABLE OF NUCLEAR BLAST DAMAGE

Type of Damage	Area suffering the given type of damage (hectares)		
	18-kt atomic* (fission) bomb (WWII)	0.91-mt** hydrogen (fission fusion) bomb	9.1-mt (fission fusion) bomb
Craterization by the blast wave	0	0	0
Trees blown down by the blast wave	565	14,100	82,000
Trees killed by nuclear radiation	129	648	1,250
All vegetation killed by nuclear radiation	18	312	759
Dry vegetation ignited by thermal radiation	1,170	33,300	183,000
Vertebrates killed by the blast wave	43	591	2,740
Vertebrates killed by nuclear radiation	318	1,080	1,840
Vertebrates killed by thermal radiation	1,570	42,000	235,000

* kt = Kiloton or the equivalent of 1000 tons of TNT.
** mt = Megaton or the equivalent of 1,000,000 tons of TNT.

Source: World Armaments and Disarmanents:SIPRI Yearbook 1978.

FIGURE OF NUCLEAR BLAST DAMAGE

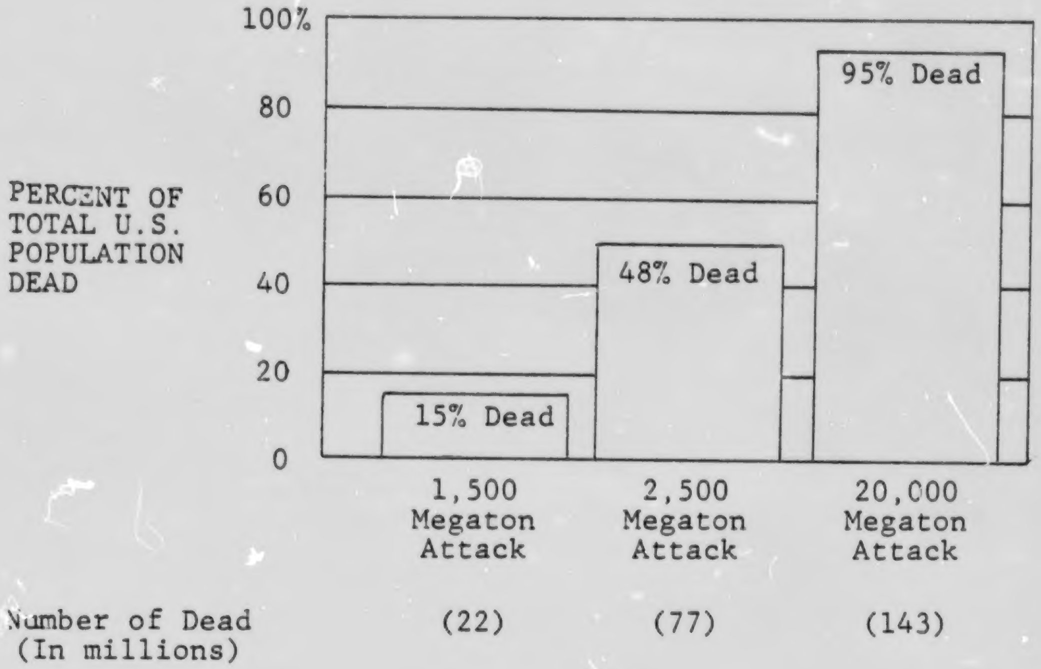

Thermal Radiation
(travels at speed of light—186,000 mps)
1st-degree burns, rayon cloth ignites
2nd-degree burns, crumpled newspaper ignites
3rd-degree burns, light fabrics and dry leaves ignite
Heavy cardboard box and auto upholstery ignite
Auto body sheet metal melts
Auto body sheet metal vaporizes; glass panel melts
100
70
60
45
19
11
0
(miles)
40
24.5
18
12
6.5
0
Blast
(travels faster than sound—over 770 mph)
Lung injuries, streets impassable
Reinforced concrete structures damaged
Eardrum injury, telephone and power lines down
Frame houses collapse, most trees blown down
Injury to persons thrown or hit by debris

Effects of 100 megaton nuclear explosion in the air. Redrawn from Samuel Glasstone, ed., The Effects of Nuclear Weapons, U.S. Atomic Energy Commission, Washington, D.C., 1957, revised 1962.

Source: Joseph Moore and Roberta Moore, War and War Prevention, 1974, p. 4.

DATA SHEET: DESTRUCTIVENESS OF NUCLEAR WEAPONS

Congressional hearings in 1959 revealed that less than 200 megatons of bombs dropped over American cities could result in over 40 million deaths, with millions more injured. (One megaton is the equivalent in explosive force to 1 million tons of TNT.)



Government study of the effect upon the U.S. population (1950: 150,699,000) from nuclear attack. Amitai Etzioni and Martin Wenglinsky, War and Its Prevention, New York, Harper & Row, 1970.

A biologist, Tom Stonier, in his book Nuclear Disaster (World Publishing Company, 1964) provides the following information about a 20-megaton bomb if it were exploded over New York City:

(1) About 6 million out of the 8 million inhabitants of the city would die, as would about 1 million outside of the city.

(2) If the bomb were exploded at ground level, it would create a hole 640 feet deep and over 2,700 feet wide.

(3) Ordinary brick or wood-frame houses would be completely demolished over 7 miles away.

(4) The small atom bomb dropped over Hiroshima (20 kilotons, or the equivalent of 20,000 pounds of TNT) caused fires over an area of 4.5 square miles. A 20-megaton bomb, falling on a clear day, could cause fires over more than 1,000 square miles.

(5) Lethal levels of radioactive fallout, depending on wind and weather conditions, would spread over an area of 4,800 square miles. (Another authority has stated that the fallout of a 7,500-megaton attack on the United States could so contaminate the land that it would be virtually impossible to grow any safe food. Both Russia and the United States could launch much larger attacks.)

(6) Other effects of even a single 20-megaton bomb over New York City would be the spread of infectious diseases, including plagues; severe ecological imbalance over a wide area; long-range genetic damage; increase of cancer, especially leukemia, etc.

(7) Social effects for the entire country could include economic collapse, mass hysteria and psychological damage, and possible political dictatorship.

Source: John McHale, World Facts and Trends.

cluster 8

TWO-THIRDS MAJORITY

A module for teaching secondary
school students about the
presidential veto and 2/3 majority
votes in Congress with the
aid of quantitative concepts.

Project QUESST
Boulder, Colorado
August, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Supplementary Teacher Materials

1. A Question of Votes (Answer Sheet)

Student Materials

1. The Issues
2. A Question of Votes

OVERVIEW OF THE MODULE

Introduction

When does an issue in the U.S. Senate, the U.S. House of Representatives, or both legislative houses require a 2/3 majority for passage? Why does some legislation require more than a simple majority? This module explores these questions, and allows students to become familiar with some recent public policy issues involving the presidential veto and congressional attempts to override a veto with a 2/3 majority vote. Students are also indirectly introduced to the concept of ratio. Based on an historical case, students assume the role of Senate majority leader in calculating the likelihood of overriding a presidential veto of a bill.

Description of the Materials

Courses and Topics:

American Government: 2/3 majority vote and the U.S. Constitution.

American History: 2/3 majority vote and the U.S. Constitution.

Grade Level: 7-12.

Time Required: One class period.

Concepts and Skills:

Social Studies Concepts: 2/3 majority vote and executive--legislative relationships.

Quantitative Concepts: Numbers and ratio.

Thinking Skills: Interpreting.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Calculate a 2/3 majority in the U.S. Senate or House of Representatives.
2. Identify at least two cases which require a 2/3 majority vote in at least one of the houses of the U.S. Congress.

Sources of Data:

Any major textbook on U.S. Government or U.S. History.

LESSON I: GATHERING VOTES

Introducing the Lesson

1. Distribute "The Issues" (Student Materials #1) to students. Tell students that they, just as representatives and senators, are going to have a chance to vote on each issue.

2. Allow the class a few minutes to read the fact sheet and to discuss how they would vote on each issue.

3. Have the class vote on each issue. Tally the votes for and against each issue on the chalkboard.

4. Inform students that, in reality, President Carter vetoed all three bills. To override the President's veto, Congress (or in this case, the class) would need a 2/3 majority vote.

> Whereas it only takes a majority of those present and voting to pass a bill, it takes 2/3 of the entire membership both of the House and Senate to pass a bill over a presidential veto.

5. How did the class vote on each of the three issues? Did 2/3 (or more) of the class vote in favor of any issue? Did the class pass any of the bills over a presidential veto?

6. Inform students that in reality:

   --There was no attempt to pass the defense bill over a veto. The bill was rewritten to delete the aircraft carrier that the President opposed. The President then signed the bill.

   --There was no attempt to pass the trade bill over a veto. The bill was rewritten to allow the President greater flexibility in raising and lowering duties of beef imports.

   --There was an attempt to pass the public works bill over the veto. Representatives, Senators, and Governors from some of the western states lobbied long and hard for passage of the bill.

   However, the House of Representatives failed to obtain a 2/3 majority. The bill was not passed. The President's veto was upheld.

Developing the Lesson

7. Distribute "A Question of Votes" (Student Materials #2). Divide students into small groups and have them complete the answers to the questions in the Student Materials. Answers are provided in Teacher Supplemental #1, (Answer Sheet).

8. Discuss answers with students. Points to be emphasized include:

    --In the Senate, 64 votes (out of 96 Senators) are needed for a 2/3 majority override of the veto.

    --In the House, 280 votes (out of 420 Representatives) are needed for a 2/3 majority override of the veto.

    --In the Senate, 32 + 1 or 33 votes would be enough to block the 2/3 majority attempt.

    --In the House, 140 + 1 or 141 votes would be enough to block the 2/3 majority attempt.

9. Note that in June, 1947 the Congress did pass the Taft-Hartley bill, overriding President Truman's veto.

10. Indicate to students that whereas a simple ~~majo~~rity vote is required to pass most legislation, a 2/3 majority vote is required for certain questions of special importance. Ask students if they can identify issues of special importance which require a 2/3 majority vote in either or both houses of the U.S. Congress. Issues which require a 2/3 majority include:

    --A 2/3 majority both in the House and Senate is required to pass a bill over a presidential veto.

    --A 2/3 majority in the Senate is required to convict a President against whom impeachment charges have been filed by the House.

    --A 2/3 majority in the Senate is required to ratify treaties negotiated by the President and the Department of State.

    --A 2/3 majority both in the House and Senate is required to propose a Constitutional amendment.

2/3 of the state legislatures may also initiate the amendment process.

Concluding the Lesson

11. Discuss whether or not the students think that a 2/3 majority rule requirement is a good idea.

--Does such a rule give the President too much power? Why?

--Should any of the points listed above require only a simple majority rather than a 2/3 majority? Why?

--Should any of the points listed above require more than a 2/3 majority--e.g., a 3/4 majority? Why?

--Are there any other issues of special importance which should require a 2/3 majority? If so, what are those issues?

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. A 2/3 majority of one or both houses in the U.S. Congress is required to:

   --Convict a President of impeachment charges.

   --Override a presidential veto of legislation.

   --Ratify formal treaties.

   --Initiate a constitutional amendment.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lesson of the module.

1. Have the class vote on the Equal Rights Amendment (ERA). Did the 2/3 majority required to initiate such a constitutional amendment occur in the class vote? Why or why not?

2. Examine the impeachment case of Andrew Johnson as an historical example of the 2/3 majority rule.

A QUESTION OF VOTES

The Question

1. How many Senators (of 96 Senators) need to vote in favor of the bill to get a 2/3 majority and to override the Presidents' veto?

   --96 ÷ 3 = 32 x 2 = 64, or

   --$\frac{96}{1} \times \frac{2}{3} = \frac{192}{3}$ or 192 ÷ 3 = 64 votes needed for a 2/3 majority in the Senate.

2. If three Republicans vote against the bill, how many Democrats would need to vote in favor of the bill to achieve a 2/3 majority?

   --56-3 = 53 Republicans in favor of the bill.

   --64-53 = 11 Democrats needed for a 2/3 majority.

3. Although there are more Democratic Senators in the industrial Northeast, they are more likely to be liberal and opposed to a bill that would reduce the power of organized labor. Democratic Senators from the more conservative Southeast might be most likely to support the bill. Senators from the Midwest might be the second most likely group of Democratic Senators to support the bill.

---

1. In the House of Representatives, how many of the 205 Representatives who originally voted against the bill would now have to vote in favor of the bill to get a 2/3 majority?

   --2/3 of 420 Representatives = 280 total votes needed for a 2/3 majority in the House.

   --280 - 215 confirmed votes = 65 additional votes needed to achieve the 2/3 majority.

--of the 205 Representatives who originally voted against the bill, 65 would have to change their vote and now vote in favor of the bill to achieve the 2/3 majority.

2. What is the smallest number of votes that opponents of the bill need to block a 2/3 majority? 2/3 of 420 Representatives is 280 votes needed for passage of the bill over the veto. 420 - 280 = 140 + 1 or 141 negative votes would block a 2/3 majority override of the Presidents' veto.

THE ISSUES

Defense

A recent defense bill contained an appropriation (an authorization to spend money) for a nuclear-powered aircraft carrier for the U.S. Navy. The Defense Department argued that the carrier was necessary to meet U.S. defense needs. The Navy argued that the carrier was necessary for a strong, flexible navy. Opponents argued that a carrier is too easy a target to destroy and that our money should be spent on submarines and missles. How would you vote--for or against the defense bill?

Trade

A recent piece of legislation before Congress was designed to place greater restrictions on the importation of beef to the U.S. The intent of the bill was to restrict the President's ability to raise and lower tariffs (import duties or taxes) on beef imports. The President argued that he needed the flexibility to raise and lower tariffs according to the demands of the market economy. Congress argued that it was up to them to set guidelines and that the President was seeking greater authority than was needed. In brief, it was a classic confrontation between the Congressional and Executive branches of government over the division of powers. How would you vote--for against the trade bill?

Water

A recent public works bill contained funds for a large number of water projects—mostly the construction of dams and reservoirs. Many groups claimed that the projects were necessary for flood control. In many western states, the state governments claimed that the projects were necessary in the arid west to develop the water resources needed by growing populations.

However, other groups argued that many of the projects were "boondoggles" or the results of "pork barrell" legislation. These groups felt that the funds for many of the water projects would be better spent on aid to cities, aid for the elderly or handicapped, job programs, and other social welfare projects. How would you vote--for or against the trade bill?

A QUESTION OF VOTES

You are the Republican majority leader in the U.S. Senate in 1947. President Truman has just vetoed a bill you support, a bill known as the Taft-Hartley Act. The bill was designed to reduce the power of organized labor--the unions. If the Senate and House of Representatives each pass the bill with a 2/3 majority vote, the bill will become law in spite of the veto. A 2/3 vote in each house can override a presidential veto.

As majority leader of the Senate, you need to make plans to coordinate the vote in the Senate. You need to decide how many votes from which parties and regions you need in order to get your 2/3 majority vote which will override the presidential veto.

Use the following information to answer your questions on the upcoming vote in the Senate.

Congress

	Senators	Representatives
Democrats	40	180
Republicans	56	240
Total	96	420

As it is 1947, Alaska and Hawaii have not become states. Therefore, there only 96 Senators--today there are 100 Senators.

The Question

1. How many Senators need to vote in favor of the bill in order to get a 2/3 majority and override the presidential veto? There are 96 Senators. Answer ________________.

2. As a leader of your party, you know that three (3) Republican Senators will vote against the bill. If all other Republican Senators vote in favor of the bill, how many Democratic Senators would you need to convince to vote in favor of the bill in order to get the 2/3 majority needed to override the presidential veto? Answer ______________________________.

[illegible]. As majority leader you know that the Democrats in the Senate come from the following geographic areas:

Northeast--16
Southeast--12
Midwest--6
Far West--6

Which group (which geographic region) of Democratic Senators do you think that you should focus your efforts on? Why those senators from that region?

__________ __________ __________ __________

Now turn your attention to the House of Representatives. As Senate majority leader you want to know how the bill will do in the House if it passes the Senate by a 2/3 majority.

1. Of 420 Representatives, the orignal vote on the Taft-Hartley Act in the House was 215 to 205 in favor of the bill. If you can count on those same 215 Representatives to vote again in favor of the bill, how many more votes do you need to pass the bill by a 2/3 majority vote? That is how many of the 205 who originally voted against the bill would have to change their vote and vote in favor of it to give a 2/3 majority? Answer ______________.

2. What is the smallest number of votes that those Representatives opposed to the bill need to prevent a 2/3 majority override of the Presidents' veto? Answer ____.

GIVE THE PEOPLE WHAT THEY WANT

A module for teaching high school students about local government and decision making with the aid of citizen surveys and simple quantitative techniques and concepts.

Project QUESST
Boulder, Colorado
August, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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2. Role Descriptions
3. Petition in Support of Expanding Cornville's Recreation Program
4. Latter to the Editor
5. Letter from Grover Street Neighborhood Association
6. Letter from Mrs. Sims
7. Letter from Cornville Police Federation
8. Steps in Decision Making
9. Steps in the Survey Process
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11. Citizens Survey Questionnaire

OVERVIEW

Introduction

How do local governmental decision makers know what their constituents want? Should they respond to every phone call or letter they receive? Should these decision makers react only to special interest groups who organize campaigns to influence their decisions? A growing number of political scientists and others interested in local decision making are advocating the use of more systematic methods of obtaining feedback from citizens on issues of public policy. This module explores the application of survey techniques in gathering information to be used in local decision making. The students will discuss different ways in which decision makers may gather information. They will examine the steps in the survey process. And they will consider the importance of sampling and some kinds of data analysis.

This module will help students to understand the survey process and to improve their skills in formulating questions, gathering data, analyzing data, and making decisions. These skills are transferable to many other social sciences and social studies classes. As a culminating activity, the students construct, administer, and analyze a survey focusing on an issue of their choice.

Description of the Materials

Courses and Topics:

American Government: Local government.

American History: Decision making and local government.

Political Science: Decision making, local government, and citizen feedback.

Grade Level: 10-12

Time Required: Three class periods.

Concepts and Skills

Social Studies Concepts: Decision making and feedback.

Quantitative Concepts: Survey methods and sampling.

Thinking Skills: Comparing and analyzing.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Cite some reasons for using citizen surveys to help local governments in decision making.
2. Identify the steps in the survey process.
3. Identify and discuss techniques for determining samples.
4. Discuss reasons for making comparisons between responses to a survey by members of various groups, between responses at different times, between responses to different questions on a survey, and between survey results and other sources of information.

Source of Data:

Obtaining Citizen Feedback: The Application of Citizen Surveys to Local Governments, by Kenneth Webb and Harry P. Hatry published in 1973 by the Urban Institute, Washington, D.D., served as the basis for this module. The data employed here, however, is hypothetical and developed specifically for this module.

LESSON 1: INFORMATION FOR DECISION MAKING

Introducing the Lesson

1. Have the students read "Council to Vote on Recreation Program tonight." (Student Materials #1)

   Ask: On the basis of the information in this news article, would you support or oppose the proposed budget increase? Do not spend a great deal of time on this question, but do ask students to give reasons for their responses.

Developing the Lesson

2. Now explain to students that information is necessary in helping government officials reach decisions. In this part of the lesson they will play roles of city council members from Cornville. Divide the class into five groups; each group will represent one council member. The council member "Role Descriptions" (Student Materials #2) should be passed out to the students--each student in group 1 receives Carol Mason's role description, each in group 2 receives Jack Hirata's, etc. Give the students enough time to familiarize themselves with the role represented by their group.

   Now, explain that each group will be given one piece of information reflecting the interests of some citizen or group of citizens in Cornville with respect to the proposed recreation budget expansion. The information will be divided in the following way:

Group Role:	Information
1. Angelo Costello	"Petition" (Student Materials #3)
2. Marilyn Kozlak	"Letter to the Editor" (Student Materials #4)
3. Charles Whittington	"Letter from Grover St. Association" (Student Materials #5)
4. Carol Mason	"Letter from Mrs. Sims" (Student Materials #6)
5. Jack Hirata	"Letter from Police Federation" (Student Materials #7)

Allow each group enough time to examine the information and discuss how it might affect the council member they represent. Have each group make a decision and prepare to explain that decision to the rest of the class. This should take no more than 10 minutes.

When all the groups are ready, ask how each would vote on the proposed budget expansion. It is likely on the basis of available information that the proposal will pass.

3. Then, use questions such as the following to guide a class discussion of the role of information in decision making:

--How did the information influence your decision? The information may have raised questions about which the students had not thought; in some cases this information may actually have changed some minds. In the case of Jack Hirata, for example, much of his political support comes from groups like the Police Federation. It is unlikely that in this case he would risk the loss of such support by opposing the expansion.

--Which pieces of information would have the greatest effect on the council's decision making? Why? The students should point out that the petition, the letter from the Police Federation, and the letter from the Neighborhood Association would be likely to carry more weight since they represent the opinions and feelings of numerous people while the other two pieces of information represent the feelings of numerous people while the other two pieces of information represent the feelings of individuals.

--In what ways are all of these pieces of information biased? Each presents only one point of view without presenting information on the opposing viewpoint. There may be an equal number of people, for example, who chose not to sign the petition because they oppose the budget expansion. This information is not, however, contained in the petition.

--Why is it useful for decision makers to have information about the opinions and feelings of the people they represent? Among the points which students may mention are that such information may provide:

- a measure of citizen satisfaction with available services;
- facts such as the number and characteristics of users and non-users of various services;
- the reasons why people like or dislike particular services or programs;
- insight into potential demands for new services; and
- an overview of citizen interests regarding various issues.

Information of this kind is useful in evaluating existing policies or programs as well as in planning new ones.

Concluding the Lesson

4. Ask the following questions to conclude the lesson:

--What are some techniques which may be used to obtain citizen feedback? Personal contacts, complaints, petitions, media presentations, attitude polls, and a number of other techniques should be mentioned. Allow the students time enough to brainstorm a list of 15-20 items.

--What are some of the advantages and disadvantages of the techniques we have listed? Students should point out that many of these yield quick information--e.g., complaints. On the other hand such techniques tend to yield very biased information. Explain that the remainder of the module will examine the use of surveys to provide information helpful in decision making.

LESSON 2: USING SURVEYS

Introducing the Lesson

1. You may use "Steps In Decision Making" (Student Materials #8) as either a student handout or a transparency. Ask the students to identify those steps where they think information would be useful. Be sure to have them explain their reasons. They should conclude that information is important in each step. Explain that citizen surveys may be constructed to obtain information useful in each step of decision making.

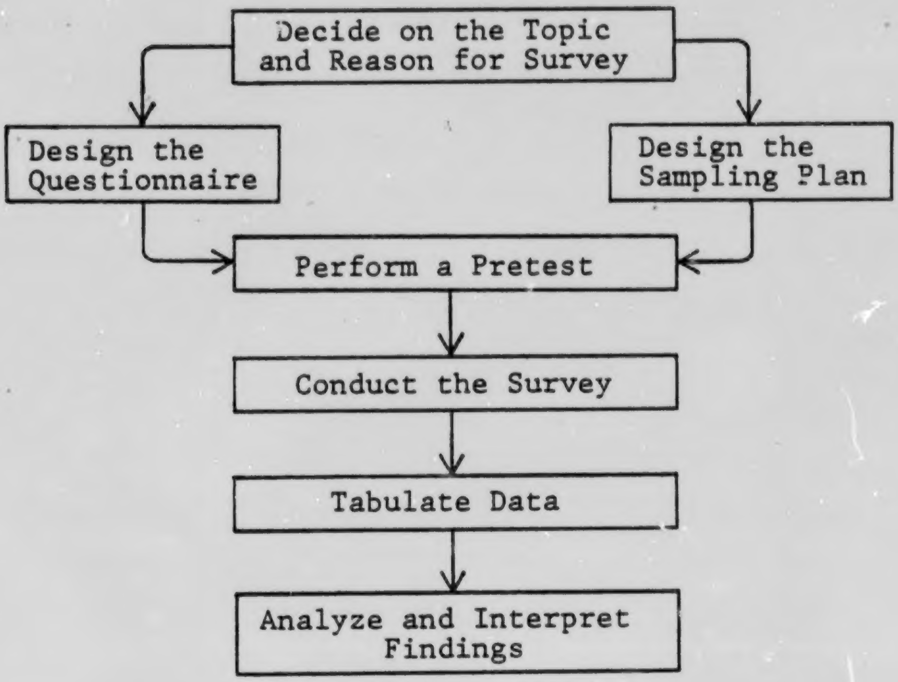
Developing the Lesson

2. Now, ask the students how they would conduct a survey that would help the Cornville City Council make its decision on expanding the city's recreation program. Allow them only a brief time to speculate on the process to be followed. Outline the process they describe on the chalkboard.
3. The next part of this lesson will help students to recognize the necessary steps in conducting a survey and the sequence of those steps. Divide the class into groups of four of five. Give each group a set of the descriptions of the seven "Steps In The Survey Process" (Student Materials #9). Explain that these steps are out of sequence.

   Note: These steps are commonly followed; however, other steps may be added to the process. Make it clear to the students that these seem to be recognized as the essential steps to be taken in a survey.

Draw a blank chart like the one below on the chalkboard.

STEPS IN THE SURVEY PROCESS


Decide on the Topic and Reason for Survey
Design the Questionnaire
Design the Sampling Plan
Perform a Pretest
Conduct the Survey
Tabulate Data
Analyze and Interpret Findings

Ask each group to decide which step fits in each box of the chart. (The answers have been provided here for your convenience.) Allow only five to ten minutes for this group work. Then, ask one group to present its sequence. The other groups may raise questions or suggest changes. Be sure that eventually the steps are outlined in the proper sequence and students understand the reasons behind that sequence.

Questions such as the following may help to guide a discussion of the survey process:

--What are some reasons for conducting a survey? Among the points students should recall from Lesson 1 are to measure citizen satisfaction with the quality of services, to collect facts such as the number and characteristics of of users and non-users of various services, to identify the reasons why people like or dislike particular services or programs, and to identify potential demands for new services.

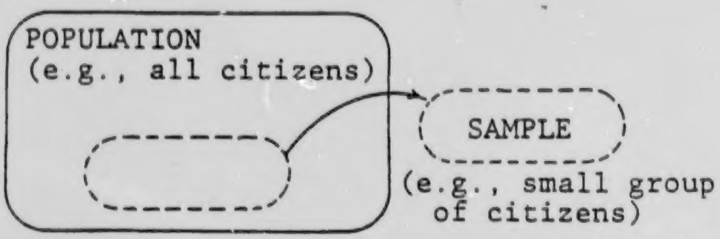
--Why is it important that a sample be representative of the population? If a sample is not representative, the results of a survey may well be misleading. For example, in the case of the recreation program expansion, what would happen to the results of the survey if every person in the sample was over 75 years old?

--How does the pretest of the questionnaire improve the survey? It insures that the questions are phrased properly and that they are valid (they collect the kind of information they are designed to collect) and reliable (doing the survey several times will result in similar findings).

--What are some of the advantages and disadvantages of conducting a survey by mail? It takes up fewer worker hours, is less expensive, and requires no training for interviewers. Despite these advantages, there are significant disadvantages. There is no way to insure that the questionnaires are completed properly (or at all), there is no way to insure that the questionnaires are returned.

4. This part of the lesson will focus more specifically on sampling.

Sampling is basic to any form of statistical analysis or technique. The investigator or decision maker wishes to find out something about the population--e.g., all citizens of a city. But to poll each individual would be nearly impossible, and, even if it were possible, the costs would be prohibitive. Rather than polling the entire population, then, the investigator polls a sample of the population. A sample is a subset selected from the population.


POPULATION
(e.g., all citizens)
SAMPLE
(e.g., small group of citizens)

Among the reasons for sampling are: 1) it decreases costs, 2) reduces number of people required for collecting data, 3) may be done quickly, 4) helps to obtain data that may not otherwise be available, and 5) helps to obtain more comprehensive data.

An example of using sampling to obtain data that would not otherwise be available is the manufacturer of firecrackers to insure that they will explode. What would happen to his profits if he tested every one of his products?

5. Have the students read "Sampling in Cornville" (Student Materials #10). Ask them to discuss the advantages and disadvantages of each sampling technique used.

Angelo Costello's technique is an example of random sampling. Each person has the same chance of being selected in the sample

Charles Whittington's technique is an example of equal-size stratified sampling. In this case the strata are defined by geographic location.

Carol Mason employed a proportional stratified sample.

Jack Hirata's sample was clearly biased.

Marilyn Kozlak's technique is known as systematic sampling.

Among the points which should come out of this discussion are:

- Random sampling does not always yield a representative sample.
- A statified sample can usually help make a sample more representative.
- The basis of the stratification should be related to the information sought.

  In this case, place of residence would almost certainly influence choice of location for a football stadium.
- Systematic sampling is simple to use.
- A biased sample may result in misleading findings.

Concluding the Lesson

6. Go back to the steps in decision making and ask students to summarize the ways in which decision making can be improved by the use of survey techniques.

LESSON 3: ANALYZING THE SURVEY RESULTS

Introducing the Lesson

1. Pass out copies of the "Citizens Survey Questionnaire" (Student Materials #11) to the students and ask them how the information gathered using this questionnaire might help the Cornville City Council reach a decision. The following questions might help guide the discussion:

--Would the information from this survey reflect the feelings of Cornville's citizens more or less accurately than do the forms of information used in lesson 1? Assuming the sampling design employed was suitable, the survey would yield more objective information about what action is favored, who favors it, conditions leading to these opinions, etc.

--If the information from the survey contradicted the other information--e.g., letter to the editor--do you thing the City Council member might change her/his mind? Why or why not? Students might indicate that some groups such as labor unions carry a great deal of power because they are able to get their members to vote in a particular way. Information on the attitudes of such groups may, then, be even more important than the attitudes of the general public. This raises the question of to whom should the decision-makers be responsive. You may wish to explore the value implications of this question with your students.

Developing the Lesson

2. Explain that so far the class has been talking about comparing survey results with information from other sources--letters, petitions. Such comparisons make up one form of survey analysis. Additional kinds of analysis might involve comparisons such as the following:

   - responses by members of various groups;
   - responses at different times; and
   - responses to different questions.

   Conduct the following matching exercise with the class. The correct answers are circles for your convenience.

   Types of Analysis

   A. Compare survey results with other information.
   B. Compare responses to different questions.
   C. Compare responses of members of different groups.
   D. Compare responses at different times.

   Directions: Match each of the findings below with the type of comparison it employs.

   1) Those people who live in the Riverside area use the recreational facilities more often than those who live in the Grover Street district.

      A B C D

   2) Before the council decided to provide lighting in the parks, most people rated the hours of operation "poor". A year after the lighting was installed most people rated the hours of operation "very good."

      A B C D

3) 80% of those people who had not used any recreational facility in the past month rated the safety of such facilities as "poor."

A B C D

4) Mr. Costello has recently received ten complaints about the condition of equipment in the city's parks; however, the survey results showed that 92% of those who responded to the survey rated the equipment either good or very good.

A B C D

3. To follow up the matching exercise ask the students to provide examples of other comparisons they might make in the analysis of responses to the questionnaire.

Concluding the Lesson

4. Now, explain that the final part of the lesson will engage students in designing a survey to gather information about a topic of their choice. Included here are a set of steps to follow in this activity.

   - define clearly the topic to be investigated and what you want to know.
   - formulate questions. The questions should be straightforward and answerable with a choice of predetermined answers. If the questions are too open ended, it will be difficult to compare answers. The predetermined choices make tallying responses simpler.

As an example, you may ask the students which of the following questions is better, according to these criteria and discuss their answers:

--What do you think about pollution:

--Do you think the air pollution problem is

_______ critical, _____ very serious, _____serious,

_______ of some concern, _____of no concern?

- Design the survey questionnaire. Pick five to ten clear questions to include in the poll. You may also wish to collect some data on the people who respond to the survey. Age, sex, race, etc. may be important in influencing attitudes about public policy issues. Collecting such data on survey respondents will make analysis of such relationships possible. The students should decide what, if any, information of this nature they wish to collect, but encourage them to limit it to only a few items.
- Have another class respond to the questionnaire as a pretest. Revise the questionnaire if necessary.
- Devise sampling procedures for administering the survey. In this case each student might ask two to five adults at random in the community to complete the survey questionnaire.
- Conduct the survey.
- Tabulate results. These should be visible to the entire class. The structure of the questions and potential response will determine the form of the table/chart to be used in this stage.
- Analyze the survey results according to the four points listed in 2 above,

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. Local decision makers need information at every step of the decision making process. Often such information comes from sources such as the following:
    - personal contacts
    - complaints from individuals
    - letters to the editor
    - citizen organizations
    - special interest groups
2. Citizen feedback may help government decision makers:
    - judge citizens' satisfaction with the quality of specific services;
    - identify facts such as the number or characteristics of users and non-users of various services;
    - identify reasons why people like or dislike particular services or programs;
    - identify potential demands for new services; and
    - gather citizen opinions on various community issues.
3. Citizen surveys are effective means of gathering information for use in the decision making process. The steps which should be followed in the survey process are:

- Decide on the topic and reason for the survey
- Design the questionnaire
- Design the sampling plan
- Perform a pretest
- Conduct the survey
- Tabulate the data
- Analyze and interpret findings

4. Careful attention must be paid to designing a sampling plan if the survey results are to accurately reflect the attitudes of the population. Among sampling techniques which help to insure representativeness are:
    - random sampling;
    - stratified sampling;
    - proportional sampling; and
    - systematic sampling.
5. Analysis of survey results should involve comparisons of:
    - responses to the survey and information from other sources;
    - responses by members of various groups;
    - responses at different times; and
    - responses to different questions.

COUNCIL TO VOTE ON RECREATION PROGRAM TONIGHT

The Cornville City Council will meet tonight to consider increasing the Recreation Department's budget by 450,000 dollars for next year. The proposed budget increase would be used to expand the city's recreation program to include evening sporting events at all the city's parks. Lights would be installed, and additional supervisory staff would be hired.

"This program expansion will allow us to use our park facilities more efficiently", claimed park commissioner Doug Switzer yesterday in a special interview.

None of the five city council members has publicly stated a position on the issue.

ROLE DESCRIPTIONS

Angelo Costello

You have lived in Cornville since you were born 38 years ago. For the last eight years you have served on the city council. The newspapers claim that your most effective political characteristic is the way you keep in touch with the people in your district, the Riverside District. Each Tuesday you ride through the neighborhood on your bicycle talking to the people who are out in their yards. The last couple of times you have done this, several people brought up the proposed expansion of the recreation program. Nearly everyone seemed to think it was a good idea.

Charles Whittington

You represent the district containing the greatest concentration of blacks in Cornville. In the past you have tried to support programs which would help your community. You believe that athletics are important to building character and resourcefulness. And it seems like an expanded recreation program may help young blacks in Cornville.

Carol Mason

You were the first woman ever elected to the Cornville City Council. The Pine Hill district, which you represent, is the most well-to-do part of the city. Some residents have claimed that "bad elements" are moving in, but you think that most of the changes have been for the better. Most of the people stay home and don't get involved in community affairs. The parks, you believe, could be build into strong community centers.

Jack Hirata

One of the few Asian-Americans in the city of Cornville, this is your first term in the city council. Much of your support in the last election came from labor unions, including the Police Federation. You believe that the expansion of the recreation program may be too costly for the benefits that will result from it.

Marilyn Kozlak

Your mind is not yet made up on the issue of expanding the city's recreation program. You think that it would be great for those people who make use of the parks, but you are not sure how large a segment of Cornville's population this is.

PETITION in SUPPORT of EXPANDING
CORNVILLE'S RECREATION PROGRAM

We, the undersigned, as citizens of Cornville wish to lend our support to the proposed increase in the budget of the Cornville Recreation Department. Such an increase will certainly provide all of our people with greater opportunities for enjoying the outdoors in a carefully maintained and safe environment.

Name	Address	Phone

(200 names appeared at the botton of this petition.)

To the editor:

I have worked with young people in athletics in this city for the past fifteen years. We have some fine young athletes, but they have often been hampered in their training by the lack of good facilities. Last year our high school football team had to practice before school because there were no lighted fields available.

The proposal before the city council to expand the recreation program in Cornville in long overdue. Providing new facilities will be a big step toward improving the performance of all of Cornville's athletic teams.

Bill Jones
Coach, Cornville High School

GROVER STREET NEIGHBORHOOD ASSOCIATION

Thelma Puchette, Chairperson
Grover St. Neighborhood
Association
118 W. 16th St.
Cornville, 17637

Mr. Charles Whittington
Cornville City Council
City Hall, Room 17
Main St. and 1st Avenue
Cornville, 17637

Dear Councilman,

The black parents of the Grover Street District are very concerned about the proposed expansion of the city's recreation program. We believe that as the representative of our district you should be aware of our concerns. First, the money to be spent will not benefit all of the people in the city equally. The Pine Hill district has four parks, the Barker Creek district has five parks, the Riverside district has three parks and a beach, and our neighborhood has only one park. This is unfair. We feel that it would be more beneficial to build an additional park in our neighborhood and only provide lighting in one park in each district.

Second, the funds to be allocated for the expansion program could be used for other social programs that may benefit those who are in the greatest need. New housing could be built, or necessary repairs on streets could be made.

Finally, the members of the Cornville Black community have not been hired on an equal basis by the Recreation Department. Until this inequity is corrected, we cannot support any expansion of its program.

Sincerely,

Thelma Puchette, Chairperson

Ms. Carol Mason
Cornville City Council
City Hall, Room 17
Main Street and First Avenue
Cornville, 17637

Dear Ms. Mason,

I have lived near Prospect Park in the Pine Hill district for all of my life. I have seen the park become less and less attractive over the years. Oh, the Park Board does its job, but the young people who come to the park are nothing but hoodlums. I don't even dare to sit on my front porch while they are around. These ruffians yell at each other, smoke cigarettes, and harass the people in the neighborhood.

Now, I see that someone is suggesting that they should put lights in the parks so these young thugs can play till all hours of the night. I hope that you will realize what a bad effect this wouldhave on our neighborhoods. Please vote against this terrible plan.

Sincerely,

Mrs. Constance Sims

CORNVILLE POLICE FEDERATION

Capt. John O'Malley
Cornville Police Federation
171 E. 2nd Avenue
Cornville, 17637

Mr. Jack Hirata
Cornville City Council
Main and 1st Avenue
Cornville, 17637

Dear Jack:

At our last meeting the membership of the Federation agreed to support the proposed recreation program expansion. The teenagers in Cornville need opportunities for wholesome entertainment in the evenings. The suggested lighting in the parks will expand these opportunities. It will also make our job of patrolling the parks easier. I hope that you will consider lending your support to the proposal.

Sincerely,

John

STEPS IN DECISION MAKING

- IDENTIFY THE PROBLEM OR ISSUE
- OUTLINE ALTERNATIVE COURSES OF ACTION
- CONSIDER CONSEQUENCES OF ALTERNATIVES
- REACH A CONCLUSION
- TAKE APPROPRIATE ACTION
- JUDGE EFFECTIVENESS OF ACTION

STEPS IN THE SURVEY PROCESS

A Perform a Pretest

The questionnaire is administered to a small number of people to insure that the questions are clear and are not interpreted differently by people responding to the questionnaire. This test of the questionnaire helps to insure that it gathers the appropriate kind of information. It may be necessary to make some changes in the questionnaire based on the pretest.

B. Tabulate Data

The results of the survey must be organized and reported systematically. Often, average scores are reported for each question. All scores may be recorded on a table, graph, or chart. This step insures that the information gathered from a survey is presented in an understandable manner.

C. Design the Sampling Plan

When conducting a survey, it is usually impossible to administer the questionnaire to all members of a population. First, this often is too expensive. Second, it is too time-consuming. Third, it requires too many people to administer the questionnaire. To avoid these problems a sample or samples of the population are selected to respond to the questionnaire. A sample is a part of

Design the Sampling Plan (continued)

the larger population. It is important that the sample accurately reflects the nature of that population. Such a sample is considered to be representative. This step should insure that the sample of people surveyed is representative of the entire population.

D. Decide on the Topic and Reason for Survey

A survey may be conducted on many topics and for many reasons. The decision makers may wish to know what steps citixens think should be taken; or they may wish to know how citizens would react to alternative courses of action; or they may wish to know how citizens feel about an action they have already taken. This step clarifies the purpose of the survey.

E. Design the Questionnaire

The questions asked of citizens must be clear and understandable. Furthermore, they should be phrased in such a way that they do not lead respondents to answer in one particular way. It is also important to find out information about the people who answer the questionnaire--age, sex, educational level, etc. This step involves the identification of which questions will be asked of citizens who are surveyed.

F. Conduct the Survey

The questionnaire may be administered in person, by phone, or through the mail. There are also other ways of conducting the surveys. Some ways take more time than others, some are more expensive, and some insure responses to all questions. Conducting the survey in person insures the greatest control over the return of responses but it is also the most expensive method. This step results in the actual collection of information.

G. Analyze and Interpret Findings

When the results of the survey have been collected, they must then be analyzed and interpreted to determine what they mean. Do they show that some kinds of people--e.g., women—favor a particular action while others oppose it? Do they show that the citizens are poorly informed on a particular issue or well informed on that issue. Do the survey results support or contradict conclusions based on other sources of information?

SAMPLING IN CORNVILLE

Last week the Cornville city council decided to build a new football stadium. To help reach a decision in its location they designed a brief questionnaire. Each council member was responsible for seeing that a sample of one hundred people were interviewed. Here's how they did it.

Angelo Costello

Angelo put the names of all registered voters in a big box and drew out 100 names. Then he sent staff members to the homes of these people to get their responses to the questionnaire.

Charles Whittington

Mr. Whittington put the names of registered voters from each of the city's five council districts in separate boxes and drew twenty names from each box. He also sent staff members to get responses.

Carol Mason

Ms. Mason, knowing that half of the city's voters live in one district--Barker Creek--put the names of registered voters from each district in a separate box and drew fifty from the Barker Creek box and ten from each of the others. She then sent staff to get responses.

Jack Hirata

Jack asked 100 members of the Police Federation to complete the questionnaire.

Marilyn Kozlak

Marilyn picked one family to interview on every fourth city block in Cornville. Her staff conducted the survey.

CITIZENS SURVEY QUESTIONNAIRE

Hello, my name is ______________________________ and I am undertaking a survey for ___________________________________. We are interviewing a selected sample of residents in your area to help the government better plan its program. We want to ask you about the city services that are provided by the city.

The information you give us will be strictly confidential and no names or addresses will ever be revealed.

Section A. Questions on General Issues

1. What are one or two of the main problems in your neighborhood (considering the neighborhood as within four blocks of your home)?

   ____

   ____

2. Thinking of these problems in the neighborhood that are important to you, do you think the public officials in the city (county) really do the things you want?

   Most of the time _________; Some of the time __________;
   None of the time _________; No opinion________; Don't
   wish to answer________.

3. Do you feel that if you contacted someone in the city (county) government about how things are run, you could influence them?

   On most problems________; On some problems____________;
   On no problems__________; No opinion_____________; Don't
   wish to answer_________.

Section B. Questions on Recreational Facilities

4. Recreation is sometimes thought of as the pleasant activities that are available during your free time after school or work and on weekends. What do you think of the recreation available in your neighborhood?

Very Good __________ Fair _______________
Good _______________ Poor _______________

IF FAIR OR POOR, ASK

Would you tell me why you say that? __________________________

____

5. Did anyone in the household use any Public Recreation facility in the city during the past month?

Yes_________ No________ No Reply _________

What is the name and address of each?

a. _________________________________

____

b. _________________________________

____

c. _________________________________

____

6. How would you rate each facility you have access to?

Facility Name	Characteristics	Very Good	Good	Fair	Poor	Don't know
	i) Hours of Operation					
	ii) Cleanliness					
	iii) Condition of equipment					
	iv) Helpfulness and Attitude of Personnel					
	v) Amount of Space					
	vi) Safety					
	vii) Overall Rating					

7. What steps do you think could be taken to improve the city's recreational program?

____

____

____

8. What is your opinion of increasing the city's recreation budget to provide lighting in each park?

__________ In favor
__________ Opposed
__________ Don't know

THE GOVERNMENT DOLLAR

A module for teaching secondary
students about government
revenue and expenditures with the
aid of quantitative concepts.

Project QUESST
Boulder, Colorado
August, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598.

Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Student Materials

1. Income and Outgo
2. Opposing Viewpoints
3. The Budget Problem

OVERVIEW OF THE MODULE

Introduction

How much does a state spend in a year? What does it spend it on--how much on which agencies or programs? If you were forced to cut a state budget, which agencies would you cut--education, higher education, social welfare? How does a governor or a state legislator decide budget issues? This module explores these questions and allows students to take the role of a budget analyst on the Governor's staff to explore the tradeoffs made in deciding budget issues.

Government spending and tax rates are highly controversial political issues. The Proposition 13 movement in California to limit tax rates is a recent example of a citizen movement intended to force government to curb spending. Throughout the history of the country there have been similar movements to limit city, state, and federal government. Over the same period, however, there have been growing demands from citizens for more government programs and services. The question for politicians then becomes a question of balance--how to balance taxes on one hand with spending for programs on the other. This module introduces students to the complexity of this issue.

Description of Materials

Courses and Topics:

American Government: Government income and expenditures, government growth, and the role of government.

Current Social Issues: Government taxing and spending.

American History: Government income and expenditures, government growth, and the role of government.

Grade Level: 11-12.

Time Required: Two class periods.

Concepts and Skills:

Social Studies Concepts: Government income and expenditures, government growth, and the role of government.

Quantitative Concepts: Graphs (circle) and tradeoffs.

Thinking Skills: Analyzing and evaluating.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Identify some of the major areas of government expenditure at the state level.
2. Identify the types of information needed in order to make reasoned judgements about government budgets.
3. Identify the types of tradeoffs involved in cutting government budgets.

Sources of Data:

The 1977-78 *Executive Budget Summary* was the source of data on state expenditures for Colorado. The *Summary* is published annually by the Office of the Governor, Colorado. The 1977 edition of the *Statistical Abstract of the United States* was the source of the circle graphs on state and local budgets. The *Abstract* is published annually by the Bureau of the Census, Department of Commerce.

LESSON 1: OPTIONS

Introducing the Lesson

1. Distribute "Income and Outgo" (Student Materials #1), and allow students a few mintues to read it.

2. Elicit analysis of the two graphs by asking questions, including:

   --From where do state and local governments obtain the greatest proportion of their annual income? The smallest proportion? The largest proportion of income is derived from property taxes--20%. The smallest proportion of income is derived from utility taxes and taxes on the sale of liquor.

   --Where, for what programs and services, do state and local governments spend the greatest proportion of their budget? The smallest proportion? The largest expenditure item is education. The smallest expenditure item is police and fire protection.

   --People apparently want lower taxes, but they also want to receive government programs and services. How may these two opposing needs be met by government?

3. Divide students into small groups. Suggest to students that one option being considered in a number of states is to legalize and tax gambling. By taxing gambling, the government receives more income to fund programs and services, yet most citizens do not view this as another burdensome tax on the public. Give each group copies of "Opposing Viewpoints" (Student Materials #2). Each group should take the role of legislative staff. They are to review the four positions, discuss them, and make a policy recommendation to the legislature of the state concerning the proposal to increase state income by legalizing and taxing gambling in the state. Should gambling be legalized by the legislature--Yes or No?

4. Allow groups to share with the class their policy recommendations to the legislature. Also, what do students think might happen in their own state with such a proposal? Why?

5. Tell students that, as indicated by Student Materials #1, state income or revenue is only one side of the coin. The other aspect of the state budget is state expenditures. A state that wishes to maintain or increase the current level of provision of programs and services for its citizens must continually increase state revenue (income) and the efficiency of state employees in order to meet the rising prices of goods and materials and the rising cost of labor. If revenue and efficiency are not increased, the state must cut certain programs. A maxim of budget planning for government at any level might be:

> You can give some people what they want all of the time. You can give all people what they want some of the time. But, you cannot give all of the people what they want all of the time.

Developing the Lesson

6. Suggest to students that, as stated in Student Materials #1, most citizens want to lessen their own tax burden. They also want to continue the provision of services that either benefit them directly or benefit causes that they support. However, government cannot meet both of these conflicting demands, i.e. , to cut taxes yet provide more services and programs.

7. Distribute "The Budget" (Student Materials #3) to students. It is the budget requested by the Governor of Colorado for the 1977-78 fiscal year.

8. Note that many states are faced with demands to cut government spending, to cut taxes, or both. Proposition 13 in California is perhaps the best known legislation to cut state taxes dramatically.

9. Tell students that they are going to take the role of a budget analyst on the Governor's staff. It has been decided, for political reasons, that taxes cannot be raised again. It is also apparent that additional funds from the federal government will not be available. To balance the budget, they must cut $60 million from the initial budget request. The goal is a budget of $914.5 million.

   NOTE: The budget presented in Student Materials #3 is an actual state budget from Colorado. The student exercise to cut the budget by $60 million was not actually done in Colorado.

10. Break students into small groups. Have the groups each decide how to cut $60 million from the budget, using the questions in Student Materials #3 as a guide. Tell them to read all of Student Materials #3 before answering the questions.

    NOTE: Students are to cut $60 million from the $974.5 million budget. They are not to cut all budgets by an equal percentage--the "easy way out." They must cut two or more agency budgets.

11. In general class discussion allow groups to tell what budget they cut and **why.** Points to bring out include:

    --Budget cutting is both an economic and a political action. It is an economic action to the degree that one looks at efficient management and provision of services in deciding which budgets to cut. It is a political action to the degree that one looks at pressure groups and voting blocs in favor of different agencies or programs before deciding which agencies' budgets to cut.

    --Budget cutting also involves the question of TRADE-OFFS. Budget cuts will always irritate people affected by the cuts, including government employees whose jobs may be lost and citizens who have benefitted from or who support the agencies and programs faced with budget cuts. Politicians who vote on budget cuts realize that they may tradeoff the support of some voters for a lowered budget. However, the politicians may gain the support of other voters who favor budget cutbacks. What tradeoffs did students make in cutting the budget?

> It seems that whenever voters favor cuts in government spending, they frequently expect those cuts to happen to other people's programs or to be absorbed by greater efficiency by government agencies. Individual voters may be discouraged if budget cuts hit agencies or programs that the individual supports.

--Budget cutting is a difficult task that requires more information than was presented in the student materials. For example, before deciding to cut an agency budget, such as the Health Department, one might want to know:

- How many people does the department employ?
- How many different programs does the department provide to the public?
- What are those programs? Are any required by state or federal law?
- How many citizens are served by each program?
- How effective are the programs? Do they achieve their objectives?
- What does it cost each program to achieve its program objectives?

Concluding the Lesson

12. Conclude by having students reach a general consensus on the 3 most important questions that a budget analyst for the Governor would want answered before deciding how to cut the $60 million from the state budget. How would they go about obtaining answers to these questions? How difficult might this process be?

> The number of people employed by a department would be fairly easy to ascertain through the personnel office. The number of citizens served by a program might be more difficult to obtain though agencies will have estimates if not actual figures, e.g., based on the number of cars paying the $1 entry fee for state parks, it is estimated that ---- thousand people used the state park system last year. The effectiveness of a program, however, might be very difficult to evaluate, e.g., the effectiveness of educational programs in preventing alcoholism.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. A general political trend in the late 1970's is to restrict government spending and to restrict rising taxes.
2. To meet increased costs without raising taxes, many states are looking for other sources of income, e.g., state lotteries.
3. Where state revenue cannot meet all program demands, political decisions must be made--which programs are to be funded fully and which are not. Such decisions involve tradeoffs--you trade dollar savings for fewer programs, or balanced spending for a loss of support by certain interest groups or blocs of voters.

ADDITIONAL ACTIVITIES

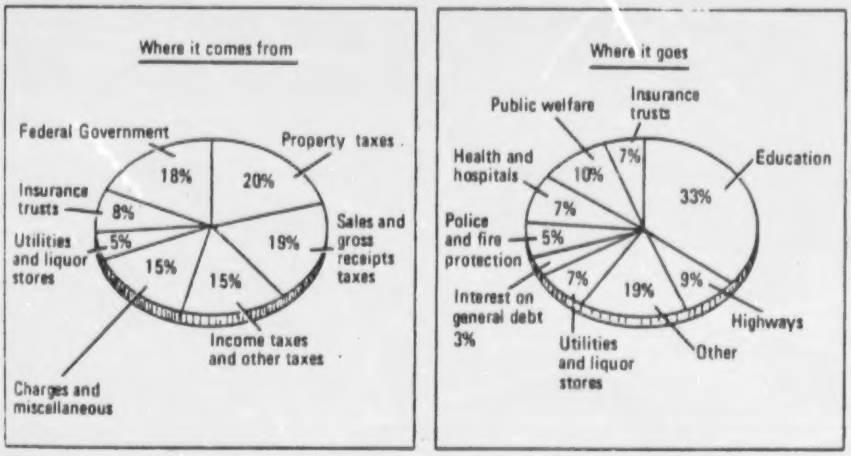
1. Have student groups take their recommended budget cuts and decide which agencies budgets were cut by what percentage. If any one cut was reported as a newspaper headline, how might it cause a reaction among readers?

2. Invite a budget officer from the city or state to talk to the class about the budget job. You should send the budget officer a copy of this lesson and some specific questions a week in advance.

3. Invite other speakers to address the "role of government." Speakers could include a state representative or senator, the head of a state agency, a lobbyist for an interest group, and a leader of a taxpayer's group.

INCOME AND OUTGO

The State and Local Government Dollar: 1975



Source: Statistical Abstract of the U.S. 1977

The two graphs indicate the general categories of income (revenue) and expenditures of the fifty states in 1975. Today, there is increasing demands for more money to be spent by states on education, health programs, welfare programs, and police and fire protection. At the same time, many citizens are saying "enough--stop" to increases in income taxes, sales taxes, property taxes, social security taxes--taxes. How may these apparently opposing needs be met? Should taxes be raised? Should government programs and services be cut?

OPPOSING VIEWPOINTS

Yes--#1. The legalization of gambling in the state is a great idea. Casinos just like Las Vegas or Atlantic City, New Jersey will generate lots of revenue for the state and allow the state to cut income tax to help working people. People are going to gamble anyway, so why not legalize it and let the state make some profit out of it. It is ridiculous to let gangsters control gambling and make all the profits when the state could do it and use the profits to relieve the tax burden.

Yes--#2. Within reason, the legalization of gambling in the state is a good idea. A state lottery would be fairly easy to set up and run, would make a nice profit for the state, and would be easy to control--to keep gangsters from taking it over. People want to gamble, so why not take gambling out of the criminal category and make it a recreational activity to be taxed. The profit that the state makes could be used either to expand certain government programs or to lower taxes for taxpayers.

No--#3. The legalization of casino-type gambling would bring undesirable people into the state. Organized crime would move in to take over such gambling operations. A lottery would not generate enough profit to warrant another government bureaucracy. The state should maintain taxes at the present level and not raise them. The state should also make government more efficient so that the taxpayers get their money's worth.

No--#4. Gambling is sinful and also illegal. We should not legalize and condone it. The state should not try to profit from such an activity, it should try and stop it altogether. The only gambling allowed should be bingo to raise money for the church or for veterans' organizations.

---QUESTIONS---

1. Should gambling be legalized in the state?
2. If yes, what type of gambling? Who will operate the gambling?
3. If no, will you raise taxes or cut programs? If you propose to cut programs, specify which programs. If you plan to raise taxes, specify which taxes. Which groups of people would be opposed to your proposals? Why?

THE BUDGET PROBLEM

The Budget

State Department	Requested Budget (millions of dollars)
Administration	8.1
Agriculture	4.1
Controller (accounting)	8.5
Corrections (penitentiary)	21.5
Education (elementary and secondary)	408.8
Governor and Lt. Governor (office staff)	1.7
Health (hospitals and disease control)	16.2
Higher Education	215.6
Highways	0.5
Institutions (hospitals and special education)	66.5
Judicial (state courts)	36.8
Labor and Employment	2.4
Law (attorney general)	3.3
Legislature (house and senate)	8.5
Local Affairs (assistance to towns and cities)	11.2
Military Affairs (emergency and civil air patrol)	0.9
Natural Resources (parks, wildlife, and water)	11.1
Personnel System	1.7
Planning and Budget Office	1.4
Regulatory Agency (regulation of businesses)	6.6

Revenue (licenses and tax control)	8.6
Social Services (welfare)	128.4
Secretary of State	0.9
Treasury	1.2
TOTAL BUDGET REQUEST	$974.5

- - - - - - - - - - - - - - -

The Problem

You are to take the role of a budget analyst on the Governor's staff. You have been told that:

1. The $974.5 million budget originally proposed for 1977-78 is $60 million over what the state Revenue Department projects as state revenue (income).
2. Taxes cannot be raised this year--neither the individual taxpayers nor business would stand for that.
3. Additional funds from the Federal Government will not be available to the state.
4. The government budget must be balanced to avoid charges by the citizens of excessive government spending.
5. Therefore, the state budget must be cut by $60 million to balance the budget.
6. Furthermore, any proposed budget cuts must fall upon two or more state agencies. The Governor has specifically told you that he does not want to cut all budgets of all agencies by the same percentage. Political opponents would charge a lack of effective leadership. Voters might think the Governor lacked good management skills. So, the decision is to take a hard look at where to cut budgets. You can cut where you want as long as all cuts are not equal and two or more agencies budgets are cut.

In deciding which agencies' budgets to cut you should answer (on paper) the following questions for each separate agency:

1. The name of the agency.
2. The dollar amount to be cut from the agency budget.
3. The reason for cutting the budget of this agency. Why is this agency one that could or should be cut? What specific types of programs might be cut in the agency?
4. The impact of the proposed cut. Who might be hurt by the cut? Who are the people served by the agency that might protest any cut in the agency budget? Which people might favor a cut in this budget?
5. To do a more effective analysis, what additional information would you need? For example, the number of people employed by an agency or the number of citizens served by the agency.

- -

The Agency Defense

The state agencies have been informed that the proposed state budget is to be cut. Each agency fears that its budget will be one of those cut. As an analyst, you have received phone calls from a number of directors of state agencies. The directors each want to meet with the analyst in your office to defend their agency budgets. Listed below is a sample of some of their comments given over the phone.

1. Commissioner of Education--phone comments. "I would like to meet with the budget analysts. I have already scheduled a meeting with the Governor's chief aide. The Education budget is the largest in the state but there is no excess there. In fact, we need a budget increase. If the courts decide that local property taxes are not a fair way to fund schools then the state will have to pick up more of the education bill if education is not to suffer. The state will also have to pay part of the costs of a number of new programs required by federal and state government--programs for the handicapped, for ethnic minorities, and for certain low income family children."

2. Social Services Director--phone comments. "I would like to have you meet with me, my deputy director, and my agency budget officer. I am aware that some people feel that welfare services should be cut. However, the agency believes that current federal and state laws make us legally bound to provide a number of services--services which we are hard pressed to provide within our current budget. It should also be noted that a number of federal programs provide funds only if the state provides matching funds. If certain parts of our budget are cut it may mean that we will not have matching funds and so would also lose some federal money."

3. Military Affairs Director--phone comments. "Before budget cuts are decided by your office and recommended to the Governor, I would like to meet with you. A couple of points which need to be emphasized are: Due to an increasing numbers of small planes crashing in the mountainous part of the state, the civil air patrol is flying an increasing number of flights searching for downed aircraft. The floods of last spring showed us that the state's emergency preparedness plan needs to be studied and improved. We need additional staff members to work with city and county officials to improve these plans. Finally, the National Guard found that it needs to implement additional training programs for its members so that they will be better prepared to help in case of emergencies such as last spring's floods.

DON'T LOOK NOW, BUT . . .
YOUR IMAGE IS SHOWING!

A module for teaching high school students about political candidates' images and their relation to election performance with the aid of quantitative techniques and concepts.

Project QUESST
September, 1979
Boulder, Colorado

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

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1. Your Next Senator.
2. Table 1: Image Traits of Presidential Candidates, 1952-72.
3. Table 2: Performance at the Polls.
4. Gain in Tolerance Noted Among American Voters.

DON'T LOOK NOW

OVERVIEW OF THE MODULE

Introduction

How many times have you thought to yourself, "I'd never vote for that guy!"? What was it about the candidate that helped you make up your mind? Was it the candidate's appearance, his/her stand on the issues, or his/her past performance or experience? A candidate's political image has a very important affect on how much support he/she receives from the voters. This module explores ways in which a political image may be measured, and it also helps students employ some simple statistical techniques for exploring the relationship between a candidate's political image and performance at the polls.

Description of the Materials

Courses and Topics:

American Government: Elections and voting behavior.

Political Science: Elections and voting behavior.

American History: Elections and campaigns.

Psychology : Perception and media.

Grade Level: 10-12.

Time Required: Three class periods.

Concepts and Skills:

Social Studies Concepts: Perception, image, and voting behavior.

Quantitative Concepts: Measurement, correlation, and samples.

Thinking Skills: Drawing inferences and making comparisons.

Instructional Objectives:

At the conclusion of this module, students will **be better** able to:

1. Suggest ways in which abstract characteristics or ideas may be measured.
2. Transfer data from tabular form to scatter diagrams.
3. Draw inferences from scatter diagrams.
4. Discuss the impact the media has on presidential campaigns and candidate images.

Sources of Data:

The data included in Table I first appeared in the following book: Nimmo, Dan and Savage, Robert L., Candidates and Their Images, Goodyear Publishing Co., Palisades, Calif., 1976. The source for Table II is the Congressional Quarterly's Guide to U.S. Elections, which is published by Congressional Quarterly for each presidential election. "Gain in Tolerance Noted Among American Voters" was copyrighted in 1978 by George Gallup and Field Enterprises, Inc.

LESSON I: MAKING AN IMAGE

Introducing the Lesson

1. Explain to students that measuring social phenomena is the first step in statistical analysis. Measurement, however, is not always a simple process. To help students understand this point write a list such as the one below on the chalkboard, and ask students to identify means of measuring each item.

How Do You Measure . . . ?

--A Car's Speed

--The Disappointment of Losing the Super Bowl

--The Depth of the Ocean

--A Person's Personality

--The Joy of Having a Baby

Developing the Lesson

2. Allow the students 5 to 10 minutes to discuss ways of measuring each phenomenon. Encourage them to think of as many alternative measurement techniques as possible. Then, hold a brief discussion focused on the following questions:

--*Which things did you think would be easiest to measure? Why?* The students will probably indicate that a car's speed and the ocean's depth were most easily measured. This is because of their physical nature and because there are standard measures and tools already available to measure such things.

--*Which things did you think would be most difficult to measure? Why?* All the other phenomena are difficult to measure because of their abstract nature. Furthermore, no commonly accepted measure is available for grief, disappointment, or personality.

--*Which of these kinds of phenomena seem to be most important in studying social issues?* Since the social sciences focus on human behavior, abstract phenomena are commonly of greatest concern to those investigating social issues. A geographer may be concerned with distance traveled, for example, but she/he would also be very concerned with the motives behind such travel.

--How does the nature of the phenomena considered affect the work of a person studying social issues? The more abstract the phenomena, the more difficult it will be to measure. The researcher will have to search for or develop a technique for measuring each variable of concern in the study. Since common measures are very seldom available, different studies on the same phenomena may be difficult to compare.

3. Now, explain to students that they will be considering ways in which the appeal of political candidates may be measured. Hand out to students copies of "Your Next Senator" (Student Materials #1). Explain that the five individuals described are running for a senate seat. The students should read each description carefully. Then, focus a discussion around the following questions:

--What factors would you consider in deciding which of these five candidates to vote for? Among the points students might mention are education, experience, appearance, stand on particular issues, and personal factors.

--Which of these five people do you think has the best image for a political candidate? Why? Allow students time to discuss their beliefs, but be sure that they support their assertions with sound reasoning. Calvin Smith, Elaine Swanson, and Paul Mallory probably will be mentioned as having strong images because of their experiences.

--How can we measure the images of these candidates? This, of course, is the crucial question. The students should be encouraged to suggest as many ways for measuring a candidate's image as possible. Explain that a candidate's image is influenced by all of the factors mentioned already. You may wish to have them brainstorm additional factors--e.g., political party affiliation--which might influence a candidate's image.

Concluding the Lesson

4. Have the students consider "Image Traits of Presidential Candidates" (Student Materials #2). The table shows the results of interviews about presidential candidates from 1952 through 1972. Interviewers asked a sample of people open-ended questions about how they felt about presidential candidates. Comments from these interviews were grouped according to image traits--e.g., background/character--mentioned. The figures on the table represent percentage of interviewee comments which were favorable. This process represents one technique for measuring political image. Ask students which image trait(s) they think would be most closely related to a candidate's performance at the polls. Be sure the students clearly understand the meaning of each image trait.

LESSON 2: IMAGE AND THE VOTE

Introducing the Lesson

1. Review briefly with the students their speculations about which image traits are most closely related to performance at the polls. In addition, the following questions may be considered by the students in a short class discussion:

   --Which image trait do you think is most important?

   --Which candidate do you think received the greatest number of votes? Why? Have students support their inferences with data from "Table 1: Image Traits of Presidential Candidates" (Student Materials #2). Nixon in 1972 received the greatest number of votes.

   --In which election do you think there was the greatest difference between candidates' vote totals? Again, be sure the students support their inferences. The data seem to indicate that the 1964 election might have had the greatest discrepancy in vote total. The actual figures show, however, that there was a greater discrepancy in 1972.

2. Now, distribute "Table 2: Performance at the Polls", (Student Materials #3) and ask students to check their responses against the data. Students may wish to reconsider which image trait is most closely related to performance at the polls.

Developing the Lesson

3. Now, explain that scatter diagrams are one way of illustrating relationships between two variables.

> A scatter diagram is a tool used by social scientists to help them to judge how closely two variables are associated. If there is a close POSITIVE CORRELATION between the variables, the scatter diagram will form a pattern which resembles Figure A. If there is a close NEGATIVE CORRELATION, the scatter diagram will form a pattern which resembles Figure B. If there is little CORRELATION between the variables, the scatter diagram will not form a pattern but will assume random distribution such as Figure C. The stronger the correlation, the more the pattern will approximate a straight line.

FIGURE A

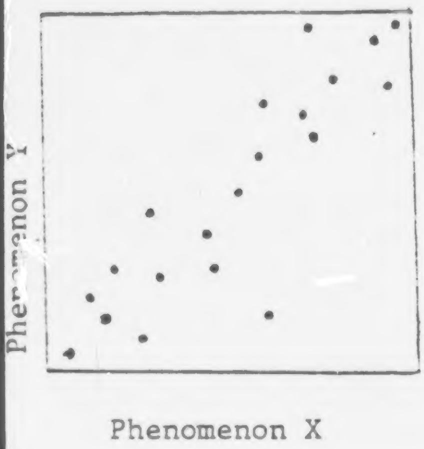


FIGURE B

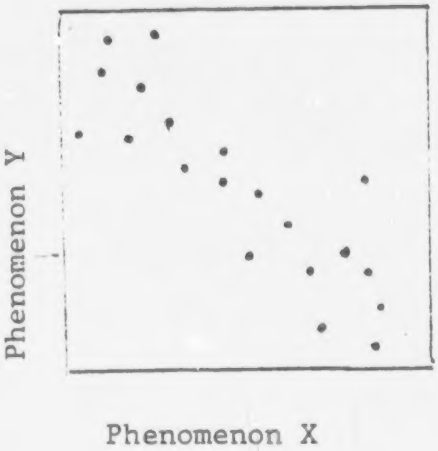
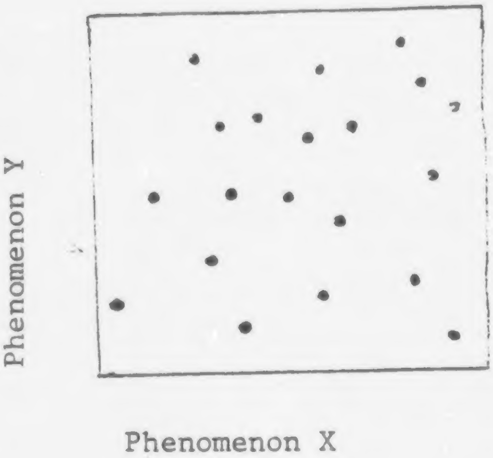


FIGURE C



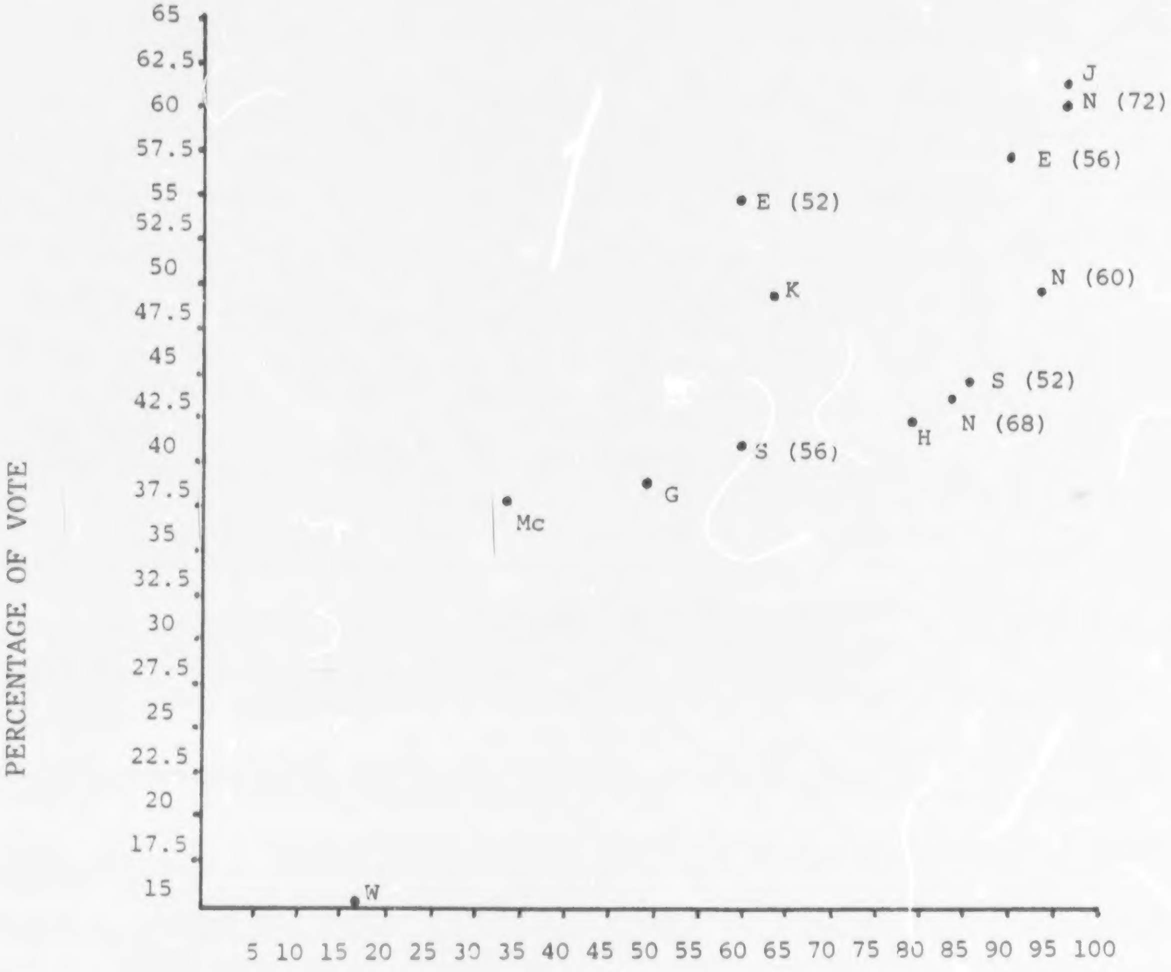
It is important to indicate that correlation does not necessarily mean causality. Several items may exhibit a high positive correlation without having a causal relationship. For example, ice cream sales at the beach and drowning have a high positive correlation, but neither one causes the other. Rather, both correlate highly with a third variable, temperature, which may be a causal factor.

4. For the next part of the lesson, have the students work in nine groups. Each group will construct on posting paper a scatter diagram illustrating the relationship between two variables. The groups should use the data in Table 1 and Table 2 (Student Materials #2 & #3) in constructing their scatter diagrams. The groups may divide the data as follows:

Group	Variable X Horizontal Axis	Variable Y Vertical Axis
1	Experience/Ability	Percentage of Vote
2	Background/Character	"
3	Personal Attraction	"
4	Party Representative	"
5	Issues	"
6	Domestic Policy	"
7	Foreign Policy	"
8	Relation to Groups	"
9	Total	"

Each group's scatter diagram should be set up as illustrated here.

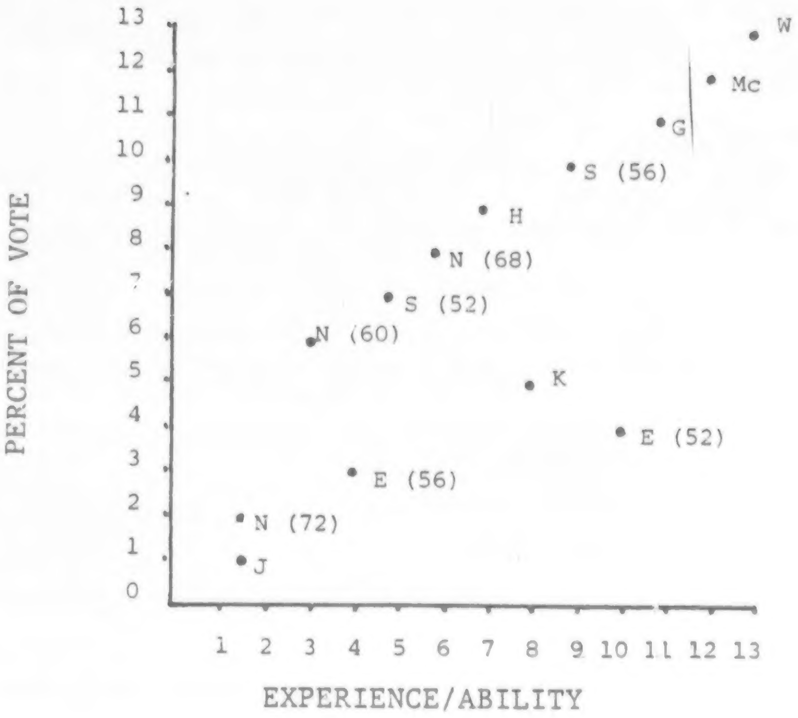
EXPERIENCE/ABILITY AND
PERCENTAGE OF VOTE



PERCENT OF COMMENTS ABOUT EXPERIENCE AND ABILITY WHICH WERE FAVORABLE.

Rather than using percentages, the groups may choose to construct their scatter diagrams using rank orders of the two variables. Or they may use both techniques. Such a scatter diagram using rank orders would look like the one below:

EXPERIENCE/ABILITY AND
PERCENTAGE OF VOTE BY RANK



5. When they have completed their scatter diagrams, have the groups post their work so the class can see them. The following questions may be used as a discussion guide:

   --Which of the correlations illustrated on the scatter diagrams appear to be strongest? The scatter diagrams using rank order for Total Image and Percent of Vote and for Experience/Ability and Percent of Vote show the strongest correlations. Furthermore, the correlations between Percent of Vote and Personal Attraction and Background/Character are also relatively strong.

   --Which seem to be the weakest? Probably Domestic Policy and Percent of Vote and the rank order scatter diagram illustrating Foreign Policy and Percent of Vote.

   --On the basis of what these scatter diagrams show, is it possible for us to determine what aspect of a candidate's political image is of greatest importance? These scatter diagrams seem to provide some hints. For example, it appears that the public's perception of a candidate's experience and ability has a strong correlation with how well that candidate does in an election. This might suggest that a candidate should spend more time during a campaign talking about her/his experience and background than about personal stands on specific issues. Students should, however, be cautioned that these are only rough indications of correlations. More sophisticated techniques are available for measuring correlations, but they are not used here. These techniques would provide a more accurate measure of the correlation between each image trait and the percent of vote.

   --Do these scatter diagrams show us what causes people to vote the way they do? No, it is not possible to draw such a conclusion. A correlation simply indicates that two variables are associated. The association may be happenstance, or it may be explained by similar responses to a third variable.

Concluding the Lesson

6. Now, turn the students' attention to this question:

--Are there any factors other than the candidate's image which may influence her/his performance at the polls? If so, what are they? Yes, the effectiveness of the candidate's campaign workers in getting people to the polls is one such factor, and the use of media is another. You may then illustrate the growing importance of television with these figures which show the total charges for political broadcasts of presidential candidates 1956-1968:

Candidate		Total Charges
Stevenson	(56)	$ 4,120,712
Eisenhower	(56)	$ 5,381,891
Kennedy	(60)	$ 6,204,986
Nixon	(60)	$ 7,558,809
Johnson	(64)	$11,012,626
Goldwater	(64)	$13,032,575
Humphrey	(68)	$15,447,989
Nixon	(68)	$22,504,858
Wallace	(68)	$ 2,450,651

LESSON 3: CHANGING VOTER TOLERANCE

Introducing the Lesson

1. So far the students have considered general image traits. It is important to look more closely at these traits. For example, a variety of things contribute to an individual's background/character and personal attraction. Have the students look at "Your Next Senator" (Student Materials #1) once again. Ask them to list characteristics for these candidates which may be grouped under background/character and personal attraction. The lists should look like this:

Background/Character	Personal Attraction
Education	Age
Degree of Past Success	Sex
Commitment	Race
Energy	Attitudes
Marital Status	Religion

Often, it is difficult to distinguish between factors which contribute to a candidate's personal attraction and those which comprise that candidate's background and character. Try not to get too involved in making such distinctions.

Developing the Lesson

2. Now, have the students speculate on how each of the following might affect the particular candidate's image:

--Elaine Swanson has been married and divorced five times.

--Calvin Smith has been accused of unfair business practices by several of his former partners and competitors.

--June Rodgers worked as a go-go dancer to pay her way through law school.

--Angelo Pino has undergone treatment for alcoholism.

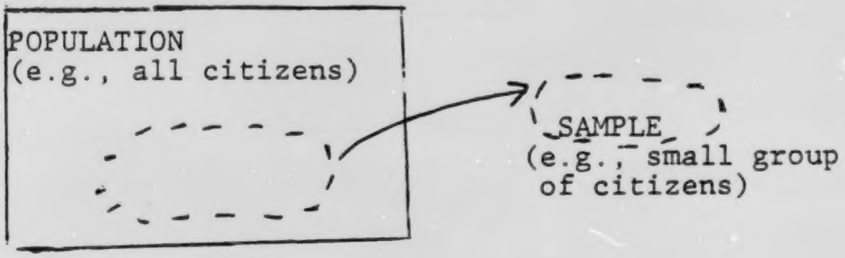
--Paul Mallory was expelled from law school for cheating.

It is obvious that all of these would have detrimental effects on the images of these candidates.

Explain to students that in the past several personal factors were considered detrimental to a candidate's political image. It was felt that voters were less likely to vote for women and members of minority groups, for example. Ask them if they think such factors are still considered negative by most voters.

After allowing a brief time for students to speculate on this question, tell the students that surveys and polls are often used to determine the beliefs and attitudes of potential voters. Surveys are usually conducted among a SAMPLE of all potential voters.

Sampling is basic to any form of statistical analysis to technique. The investigator or decision maker wishes to find out something about the population--e.g., all citizens of a city. But to poll each individual would be nearly impossible, and, even if it were possible, the costs would be prohibitive. Rather than polling the entire population, then the investigator polls a sample of the population. A sample is a subset selected from the population



Among the reasons for sampling are: 1) it decreases costs, 2) reduces number of people required for collecting data, 3) may be done quickly, 4) helps to obtain data that may not otherwise be available, and 5) helps to obtain more comprehensive data.

An example of using sampling to obtain data that would not otherwise be available is the manufacturer of firecrackers who tests one in every fifty firecrackers to insure that they will explode. What would happen to his profits if he tested every one of his products?

Concluding the Lesson

3. Have the students read "Gain in Tolerance Noted Among American Voters" (Student Materials #4). A class discussion may then focus on the following questions:

--Which of the factors considered seems to be least detrimental to a candidate's political image? Catholocism.

--Which seems to be most detrimental? Atheism.

--Does this seem to indicate that religion is or is not important to American voters? It appears from the data that it is important for a candidate to profess some religious belief, but there does appear to be a good deal of tolerance toward different religious beliefs.

--For which factor has there been the greatest change in attitude since 1958? Willingness to vote for a Black.

--Do the results of this survey indicate that a candidate's background and character are becoming less important to the voters? Not necessarily, they simply show that some particular aspects of background and character are no longer as important as they once were.

--Do you think this increased tolerance is good or bad? Why? Allow the students to express their beliefs, but be sure they are supported with sound reasoning.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. The abstract phenomena of interest to social scientists are often very difficult to measure. This is so because few standard measures and techniques are currently available. Often this lack of commonality means that different studies of the same phenomena are difficult to compare.

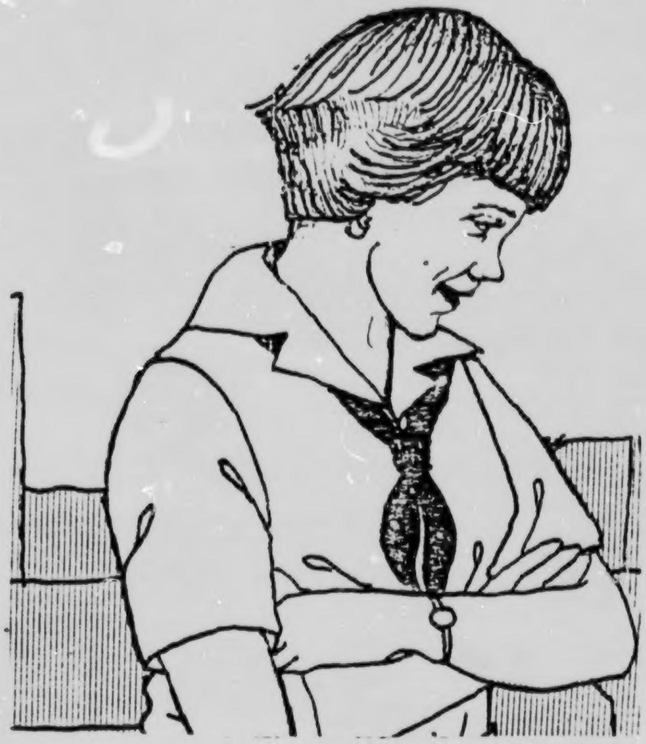
2. The image of a political candidate is a good example of an abstract phenomenon which is studied by social scientists. An image is comprised of several factors--e.g., experience/ability, background/character, personal attraction, stand on issues. It is possible to measure a candidate's image by interviewing a sample of potential voters and recording the degree to which they see each factor as positive or negative.

3. Scatter diagrams are useful tools for visually illustrating the degree to which two variables are correlated. A correlation is not a cause and effect relationship. Often one variable is affected by many others, and a scatter diagram is not effective in illustrating the relationships of multiple variables.

4. Evidence from a recent poll indicates that American voters have become more tolerant of some aspects of a political candidate's background. Race, religion, and sex seem to have become less important in a candidate's political image.

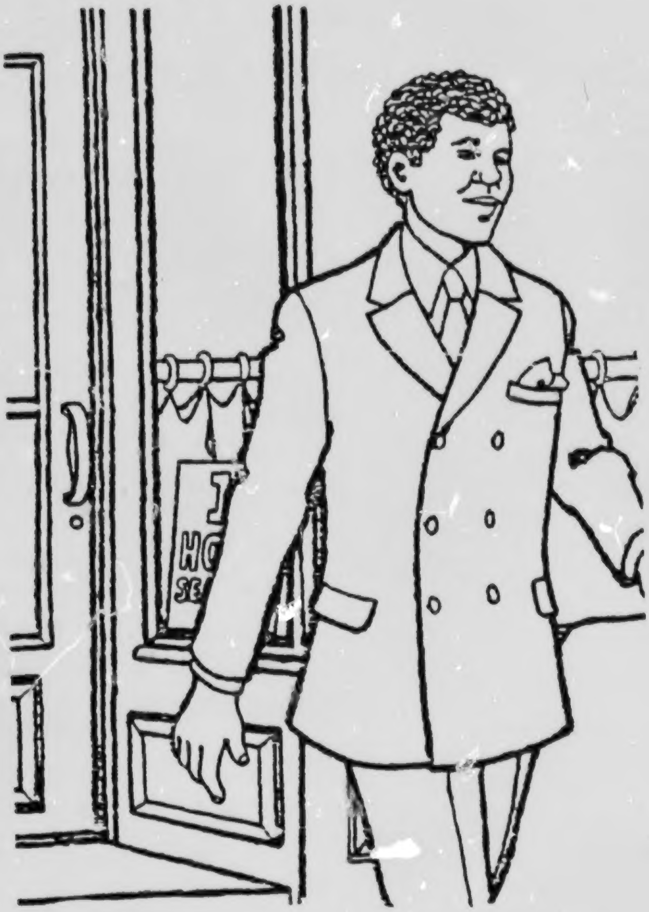
YOUR NEXT SENATOR

Elaine Swanson



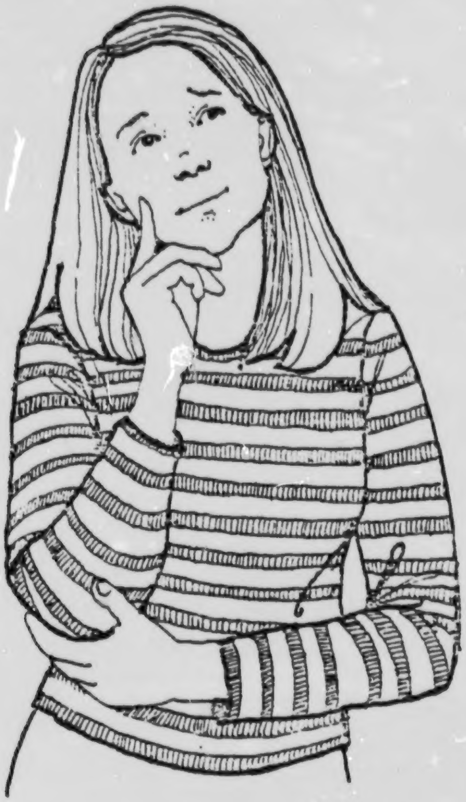
Elaine Swanson has served the people of this city for several years. She was elected to the school board two times and is currently serving her second term on the city council. Ms. Swanson holds a bachelor's degree in journalism and worked for five years as a reporter. She has a reputation for resisting too much spending. While serving on the school board, she led the fight for major budget cuts for the city's school district.

Calvin Smith



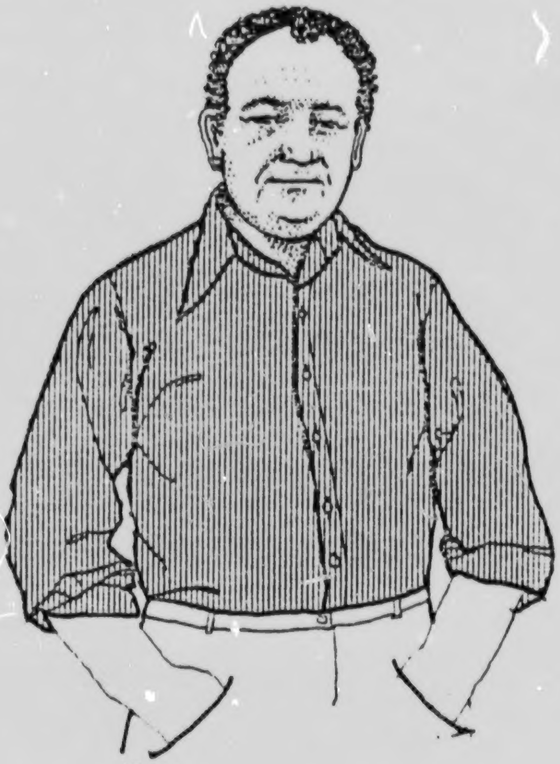
Calvin Smith has served as special assistant to the governor for the past three years. Before that he was a successful businessman. Calvin is very alert to public opinion. He carefully surveys the public's feelings before announcing a stand on a given issue. Calvin believes that a good senator should represent the wishes of his/her constituents.

June Rodgers



June Rodgers graduated from law school last June. She has been interested in politics since she was in high school. Many people have told June that she lacks the experience to be a senator and that her youthful appearance will hurt her chances for election. On the other hand, Ms. Rodgers claims that the state needs "new blood" to represent its interests in Washington.

Angelo Pino



For fifteen years Angelo Pino has worked for a large labor union. He started out as a part-time officer and served as the president of the local chapter of the union for three years. Angelo has expressed concern for the working people in the state. He believes that the policies and programs of the federal government have favored the rich and the very poor while putting the greatest burden on "the people who do all the work."

NUMBERS IN THE WORLD

A module for teaching secondary
students about numbers and their
use in the world and in the
social studies.

Project QUESST
Boulder, Colorado
October, 1978

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author (s) and do not necessarily reflect the views of the National Science Foundation.

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1. Numbers
2. Numbers Abound

OVERVIEW OF THE MODULE

Introduction

Numbers everywhere. Numbers assist us and bedevil us. Numbers are seen as valuable tools and as objects of mystery. We sometimes fear them, often misuse them, and can't do without them. Numbers are inescapably part of our world. This module explores the degree to which numbers are used to describe people as individual or group members of society. Students are asked to identify ways in which numbers are used in the social studies and to discuss some erroneous uses of numbers as illustrated in a student reading.

People are aware that there are numbers in our world, yet we often forget or ignore the degree to which we deal with numbers on a daily basis. This module encourages students to overtly recognize the role of numbers in their lives. This module also enables the teacher to indicate the need to understand how numbers are used in the social studies. An awareness of the role of numbers will enable students to function with greater ease in an increasingly technological world.

Description of Materials

Courses and Topics:

World History: Time and description.

World Geography: Time, measurement, and description.

Grade Level: 7-9: basic unit

10-12: with suggested activities for advanced students, the starred (**) items.

Time Required: One or two class periods.

Concepts and Skills:

Social Studies Concepts: Numbers in the social studies.

Quantitative Concepts: Numbers and classification.

Thinking Skills: Interpreting.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Identify the degree to which numbers are used daily to classify and describe people.
2. Identify the degree to which numbers are important social science toools for describing and classifying.
3. Understand the rational use of numbers and the limitations on the use of numbers.

Sources of Data:

No specific data source was used for this module. Daily newspapers, periodicals, social studies text books, television, and many daily activities are ready sources of the "numbers" presented in the module.

LESSON 1: NUMBERS AROUND US

Introducing the Lesson:

NOTE: This is an optional introductory homework activity. It may be more appropriate for grade levels 10-11 than for 7-9. You may omit this activity and begin the module with step 3.

1. Distribute "Numbers" (Student Materials #1) and have students read and complete it as a homework assignment.

Developing the Lesson:

NOTE: If the optional homework activity was assigned, begin with step 2. If the homework activity was not assigned then skip step 2 and begin with step 3.

2. Elicit student interpretations of the paragraph that they were to rewrite for the homework assignment. An interpretation would be:

   --Stuck on highway 101 about 15 miles away from where I want to be. Stuck and miserable, it's 97 degrees, and thinking that my old car (license number KLA 643) caused my trouble because it went dry (out of gas). What a hassle! . . . Rolling along again after 30 minutes, doing 55 m.p.h. or maybe a bit more. Talked to my friend (telephone number 303/777-7777) and said I'd be rolling in about 20 minutes from now. Rolling along again on highway 101 with the radio on 96 KZ.

   --Encourage students to "brainstorm" a quick list of daily activities that could be similarly described by a numbers interpretation.

3. Write some numbers on the chalkboard that students can readily identify and then elicit student identification of a quick list of additional numbers encountered by students in daily life.

   --The numbers written on the chalkboard could include the time school starts and ends, the time the class starts and ends, a recent score from a school sporting event, and 55 m.p.h.

--Student generated numbers could include numbers from advertisements, sports statistics, T.V. and radio station call numbers, top 10 ratings of records, CB radio call numbers, license plate numbers, telephone numbers, addresses, prices of goods, clothing sizes, and many more.

4. Divide the class into small groups. Suggest that one interesting use of numbers that we all encounter daily are those used to describe people. Have the groups compete to make the largest list of NUMBERS that could be said to DESCRIBE or CLASSIFY people as individuals in daily life. After ten minutes bring the class back together and list their numbers on the chalkboard. Numbers which describe or classify people could include:

   --Age, birthdate, IQ number, school grade, height, weight, street address, telephone number, area code, zip code, library card number, driver's license number, and locker number.

5. Stimulate student discussion of their lists. Discussion should focus on the following points:

   --What numbers did not appear on students' lists? For example, students may have neglected such "adult" numbers as credit card numbers, bank account numbers, passport numbers, social security numbers, and salary figures.

   --What numbers were listed by students that not only could be used to describe an individual but that also could be used to classify a person as a member of a group? For example, a birhtdate classifies a person as a member of a zodiac group. An area code or zip code classifies people as part of a group living in a certain geographic section of the country. A telephone number or address may classify a person as a member of a family group or roommate group.

6. Summarize that numbers are useful tools which may be used to describe and classify people. While many people may dislike "being a number" it should be recognized that such numbers as area codes and zip codes, credit and bank account numbers, and stock numbers on merchandise enable people and machines to process large amounts of information in relatively short periods of time. In such cases we all benefit by an appropriate and accurate use of numbers. Note that many ill feelings about numbers are due to instances where numbers have not been used appropriately and accurately.

Concluding the Lesson:

7. Use the discussion of numbers and individual persons as a lead-in to suggest that numbers are also used in social studies to describe, to classify, and to COMPARE. For example, the average daily temperature of a city describes the city's climate, can be used to classify the city in a climatic range such as tropical or temperate, and could be used to compare the city's climate to that of other cities.

8. Have students browse through their textbooks and jot down different numbers and how they are used in the text.

9. Encourage the class to share the different uses of numbers in the social studies found in their textbooks, and to "brainstorm" additional uses of numbers that could be used to describe, to classify, and to compare in the study of the social studies. Numbers mentioned might include those listed below:

   --Geography numbers could include temperature, precipitation levels, altitude, latitude and longitude, distance, industrial and agricultural rates, size, area, and length.

   --History numbers might include dates and time periods, war statistics, migration statistics, trade statistics, population growth rates, industrialization and urbanization levels, indicators of national wealth, foreign aid statistics, literacy rates, death rates, and inflation rates.

   --Sociology numbers might include crime statistics, family size and income statistics, marriage and divorce statistics, educational data, age pyramids, urbanization levels, and group interaction charts.

   --Other social studies numbers would include anthropological, economic, political, and psychological data. For example, voting statistics, governmental budget data, cost of living statistics, cross-cultural interaction data, personality profile tables, income and employment statistics, and many more examples.

LESSON 2: NUMBERS IN ERROR

Introducing the Lesson

1. Distribute "Numbers Abound" (Student Materials #2) and allow students a few minutes to read it, or make a transparency to use with an overhead projector.

Developing the Lesson

2. Elicit student identification of any errors in the use of numbers indicated by the eight items. Answers could include:

--Item one indicates some form of error in polling technique. Such an error could involve selecting a sample that did not accurately reflect the entire voting population.

--Item two indicates no error or misuse of numbers. It does indicate differing interpretations of how to report an event--the weather.

--Item three indicates no error or misuse of numbers.

--Item four indicates no error or misuse of numbers. It does indicate a difference between a government in debt vs. an individual or a corporation in debt--a difference that raises a good deal of controversy concerning fiscal responsibility by the government.

--Item five is a definition of someone who does not misuse numbers.

--Item six indicates no error or misuse of numbers. It does illustrate that most people fail, usually by a large amount, to estimate the answer to this puzzle.

--Item seven indicates an error in correctly carrying out the mathematical processes of multiplication and addition. The answer is 2 x 2 = 4 + 3 = 7.

--Item eight indicates no error or misuse of numbers. It does indicate some of the controversy surrounding advertising claims.

Concluding the Lesson

3. Allow a few students to volunteer recent examples that they are personally aware of where numbers were used in error or were misused.

4. Encourage a few students to describe recent examples of which they are personally aware where the accurate or appropriate use of numbers was beneficial to them or to society.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. NUMBERS, in daily life, are frequently used to describe and to classify people as individuals and as group members.

2. NUMBERS, in the social studies, are useful tools which help us to DESCRIBE, to CLASSIFY, and to COMPARE. In all of the social sciences, numbers are commonly used tools of the profession.

3. NUMBERS, when used appropriately and accurately, should assist our complex society to function effectively, or at least more effectively than would be the case if we did not use numbers.

ADDITIONAL ACTIVITIES

These activities may be used to supplement and extend the basic lessons of the module.

**1. For advanced students or classes. Have students generate lists of numbers (and examples of each number) that could be classified as economic, political, and social indicators. Such lists could include:

Economic--inflation rates, production rates, employment rates, trade figures, foreign aid figures, national debt, consumer price index, stock market figures, gross national product, and prices.

Political--results of elections, votes in legislatures or courts, results of political polls or surveys, political contributions, political party membership figures, government budgets, and number of political candidates or issues in elections.

Social--crime rates, literacy rates, educational statistics, health and wealth statistics, social class data, urbanization figures, environmental information, marriage and divorce data, religious affiliation, information, and recreational and sports statistics.

2. Have students identify and describe two uses each of numbers that they think are accurate and inaccurate, or appropriate and inappropriate, or beneficial and harmful.

3. Have students keep a "number journal" for one week and then share results in class. In the journal students could identify sources of numbers such as print, radio, television, and conversation. For each source students could list the types of numbers gathered from the source.

4. On the bulletin board make a collage of numbers taken from newspapers and magazines. The numbers should describe, classify, or compare something that would fit the study of social studies.

NUMBERS

STUCK--on 101 about 15 away from where I want to be. Stuck and miserable, it's 97, and thinking that old KLA 643 caused my trouble because it went dry. What a hassle!----Rolling along again after 30, doing 55 or maybe a bit more. Talked to 303/777-7777 and said I'd be rolling in about 20 from now. Rolling along again on 101 with 96 KZ.

At the bottom of this page rewrite the paragraph using words to make it clear, where numbers alone may be unclear.

NUMBERS ABOUND

1. A MISTAKE--In 1948 the Gallup Poll picked Tom Dewey as the next president, but Harry Truman won the election.
2. THE WEATHER REPORT--A pessimist would say there is a 30% chance of rain. An optimist would say there is a 70% chance of sunshine. Most of us would agree that there is a 100% chance of weather.
3. ZODIAC--My birthday number 7-26-1965 identifies me as a Leo.
4. DEBT--If the U.S. Government has a national debt of billions of dollars, why don't their checks bounce?
5. NUMERATE--Someone who uses numbers appropriately and accurately.
6. PROGRESSION--If I receive a gift of 1¢ today, 2¢ tomorrow, 4¢ on the third day, 8¢ on the fourth day, 16¢ on the fifth day, 32¢ on the sixth day,---$163.84 the fifteenth day---how much would I receive as a gift on the thirteenth day of the month? Estimate an answer, then figure it out.
7. (2 x 2) + 3 = 8
8. ADVERTISEMENT--You can always find 2 out of 3 individuals of some type to recommend that someone else should buy some product. "Three out of four dogs recommend---cats, as a really fun animal to chase."

READING A TABLE

A module for teaching secondary students to read and understand information presented in tables.

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Student Materials

1. Fords In Time
2. Employment Patterns
3. Tables

OVERVIEW OF THE MODULE

Introduction

Tables presenting summarized information are encountered frequently in textbooks, government publications, newspapers, magazines, business documents, and many other sources. Tables are a commonly used means of displaying a large amount of information in a concise, readable form. This module introduces students to a systematic way of reading tables to extract the greatest amount of accurate information in the least possible period of time.

Reading a table accurately is a basic skill required of anyone working in the social studies and has become a basic skill required of a literate member of American society. This module provides students with a systematic format for developing this skill using tables showing automobile prices and employment data.

Description of Materials

Courses and Topics:

Applicable to all courses in the Social Studies that use tables.

Grade Level: 7-12.

Time Required: One class period.

Concepts and Skills:

Social Studies Concepts: Prices and employment.

Quantitative Concepts: Tables.

Thinking Skills: Interpreting and analyzing.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Read data presented in tables.
2. Interpret data presented in tables.

Sources of Data:

1. The 1977 edition of the Statistical Abstract of the United States is the source of data on unemployment presented in this module. The Abstract is published annually by the Bureau of the Census, U.S. Department of Commerce.
2. The Ford Dealers Association of Denver, Colorado was the source of price information on automobiles presented in this module.

LESSON 1: AUTOMOBILES

Introducing the Lesson

1. Distribute a copy of "Fords in Time" (Student Materials #1) to each student and allow them a few minutes to read it and to look at the table.

2. As a point of interest, note that while the cost of a low-priced Ford in 1978 had risen to a little over $3,000 -- the 1925 "antique" is now worth over $6,000.

Developing the Lesson

3. Compare the paragraph to the table. Elicit student responses by asking questions such as:

   --Which is more understandable -- the table or the paragraph? Neither is inherently better. We would have to ask "better for what purpose."

   --What are strengths and weaknesses of each? The paragraph can present greater historical detail but does not lend itself to conciseness or ease of making comparisons. On the other hand, the table lacks some historical detail but presents greater detail in the number of years and prices presented. The table format also makes it easier to compare prices over time.

   > You may wish to distinguish between two types of information in the table. The year and the base price are quantitative information--we can attach a number to them. The model is qualitative information--we cannot attach a number to it.

Concluding the Lesson

4. Suggest to students that reading a table is a useful skill. Points to emphasize include:

   --Information in textbooks and real-world data (sports or consumer data) are frequently presented in tables.

   --Tables are useful for presenting complex information in a concise, readable manner.

LESSON 2: EMPLOYMENT PATTERNS

Introducing the Lesson

1. Distribute "Employment Patterns" (Student Materials #2) and have the students complete the worksheet accompanying the table.

Developing the Lesson

2. Verify students' answers to the worksheet.

   --Title, U. S. Employment Patterns.

   --Source, U. S. Statistical Abstract 1977 published by the Bureau of the Census, Department of Commerce.

   --Years, 1960 and 1977.

   --Age group, 16 years old and over.

   --Categories, male and female.

   --Occupations, none.

   --Unit of measure, thousands. For example, the total number of females employed in 1977 was 36,303,000.

   --Trends, all categories increased between 1960 and 1977 except farmworkers which decreased both for males and females.

3. Inform students that finding the answers to the worksheet questions required them to read the table in a systematic way that they should always follow. A good way to read a table is to read:

   --The title of the table.

   --The source of the information presented.

   --The footnotes to the table.

   --The column and row headings in the table.

   --The units of measure used in the table.

   --For any variability (major trends or discrepancies) in the data that may be readily noted.

4. Distribute "Tables" (Student Materials #3). Have students read it and then briefly summarize for them:

    --Title. A good title should state precisely what the table contains. The title "U. S. Employment Patterns" is not a good title because it is too vague. The title does not tell us what type of patterns.

    --Source. "Is the source reliable?" is a question that should always be asked. Does the source report how and when the data presented in the table was gathered? If we don't know how and when data was collected, then it may be difficult to judge how reliable the data is.

    --Footnotes. Footnotes supply additional information which you may need to know to read the table accurately.

    --Column and Row Headings. The headings provide additional detail on the type of information presented in the table. The headings of this table tell us that only the male-female pattern for two points in time is actually present in the table.

    --Units of Measure. Tables are often misread because people do not identify the precise type of data (e.g., total numbers or percentages) being presented. In this table the total number of males and females employed in nine separate occupational categories are reported in thousands (000's). In the table itself the final three 000's are dropped for convenience. The reader who is not careful, however, may mistakenly read incorrectly, e.g., read the male total for 1960 as 43,906 when it should be read as 43,906,000.

    --Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending upon the task at hand, the reader might wish to look for variability between males and females, between occupational categories, between years, or some combination of the above.

Concluding the Lesson

5. Identify for students some of the advantages and disadvantages of presenting information in tables, including:

--Clarity - Tables can present a large amount of information in an orderly way using a relatively standard format.

--Economy - Tables present information in a format that economizes on the use of space and words.

--Information - Tables provide a summation of the actual numbers upon which are based the statements and conclusions found in the text.

--Understanding - Tables may make it easier to compare information and to understand quickly some of the implications of the information.

--Appeal - Tables may appear foreboding or difficult to comprehend, so they are frequently ignored.

--Fear - Tables generally contain numbers and, as numbers are feared by many people, tables are avoided.

--Acceptance - There is a tendency by too many people to accept as unquestionable fact anything presented in numerical form, so tables may be accepted without critical thought.

6. Suggest that any way of presenting information will have both advantages and disadvantages. If we understand this we can take a data presentation and attempt to maximize its strengths and minimize its weaknesses when we use it.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. There is a systematic sequence, a useful way, to read a table: the title, source, footnotes, column and row headings, units of measure, and variability.

2. The strengths of presenting information in a table include clarity and economy of presenting information in a readily understandable and comparable form.

3. The weaknesses of presenting information in a table include both fear of numbers by some people or too ready acceptance of any information presented in numerical form.

ADDITIONAL ACTIVITIES

1. Provide additional tables from other sources, such as the course text, and have students discuss the strengths and weaknesses of each table.
2. Present the students with some data and allow them to make a "good" table presenting the data.

FORDS IN TIME

The first Model A produced by Henry Ford came out of the factory in 1903 and sold to the public for $850 that year. The following year the Model C was presented to the car-buying public, at a price of $950. With assembly line production, Ford began to produce more than one model each year. One benefit of the assembly line technique was that the cost of the lowest produced model actually dropped -- down to $650 in 1910, $395 by 1920, and an all-time low of $260 for the 1925 Ford Runabout. Thereafter, prices began to climb. By 1940 the lowest priced model, a standard Tudor, sold for $700. The 1950 Deluxe Business Coupe sold for about $1400, and by 1960 the Fairlane Club Sedan was going for $2285. The lowest priced Ford in 1970, a Falcon Sedan, had a base sticker price of $2450. By 1978 the price of the Pinto Pony was approximately $3200. As a final point of interest, the Runabout that sold for $260 in 1925 would today sell for between $6000 and $7000, depending on the degree of authentic restoration.

Fords: A Price History

Year	Model	Base Price
1903	Model A	$ 850
1905	Model C	$ 950
1910	Runabout	$ 650
1915	Runabout	$ 390
1920	Runabout	$ 395
1925	Runabout	$ 260
1930	Roadster	$ 435
1935	Delux Roadster	$ 550
1940	Standard Tudor	$ 700
1945	War Year--no cars	----
1946	Deluxe Coupe	$1,125
1950	Deluxe Business Coupe	$1,420
1955	Fordor Town Dedan	$2,060
1960	Fairlane Club Sedan	$2,285
1965	Mustang	$2,425
1970	Falcon Sedan	$2,450
1978	Pinto Pony Sedan	$3,200

Covers the cost of Ford production cars 1903-1978 at five year intervals.

Each model covered was the lowest priced Ford produced in that year.

Source: Ford Dealers Association of Denver, Colorado.

EMPLOYMENT PATTERNS

U. S. EMPLOYMENT PATTERNS

		1960		1977	
	Occupations	Male (000's)	Female (000's)	Male (000's)	Female (000's)
1.	Professional	4,766	2,703	7,820	5,839
2.	Managers	5,968	1,099	7,216	2,076
3.	Salesworkers	2,544	1,680	3,359	2,436
4.	Clerical	3,145	6,617	3,297	12,748
5.	Craftworkers	8,332	222	11,074	596
6.	Operatives	8,617	3,333	9,403	4,243
7.	Non-Farm Laborers	3,471	82	3,809	395
8.	Service Workers	2,844	5,179	4,717	7,535
9.	Farmworkers	4,219	957	2,259	435
	TOTAL (000's)	43,906	21,872	52,954	36,303

Employed persons by occupation and sex, 1960 and 1977, in thousands. Covers persons 16 years old and over. Yearly figures are based on monthly averages. Source: Statistical Abstract of the United States 1977. Bureau of the Census, U. S. Department of Commerce, p. 406.

Worksheet

1. What is the title of the table?_________________________
2. From where does the information come?____________________
3. What years are covered by the table?_____________________
4. What age groups are included in the table?________________
5. What categories of people are covered?____________________
6. How many occupations are included?_______________________
7. What is the unit of measure? In what form are the numbers presented?____
8. What major changes or trends, if any, do you see in the data?____

TABLES

A useful way to read a table is:

1. Title. A good title should state precisely what the table contains. The title "U. S. Employment Patterns" is not a good title because it is too vague. The title does not tell us what type of patterns.

2. Source. "Is the source reliable?" is a question that should always be asked. Does the source report how and when the data presented in the table was gathered? If we don't know how and when data was collected then it may be difficult to judge how reliable the data is.

3. Footnotes. Footnotes supply additional information which you may need to know to read the table accurately.

4. Column and Row Headings. The headings provide additional detail on the type of information presented in the table. The headings of this table tell us that only the male-female pattern for two points in time is actually present in the table.

5. Units of Measure. Tables are often misread because people do not identify the precise type of data (e.g., total numbers or percentages) being presented. In this table the total number of males and females employed in nine separate occupational categories are reported in thousands (000's). In the table itself the final three 000's are dropped for convenience. The reader who is not careful, however, may mistakenly read incorrectly, e.g., read the male total for 1960 as 43,906 when it should be read as 43,906,000.

6. Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending upon the task at hand, the reader might wish to look for variability between males and females, between occupational categories, between years, or some combination of the above.

READING A BAR GRAPH

A module for teaching secondary students
to read and understand information
presented in bar graphs.

Project QUESST
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1. Ford Runabout
2. Changing Prices
3. Cost of a Car
4. Bar Graphs
5. Growing Cities

OVERVIEW OF THE MODULE

Introduction

Graphs presenting summarized information are encountered frequently in text books, government publications, newspapers, magazines, business documents, and many other sources. Graphs are commonly used as a means of displaying a large amount of information in a concise, readable form. This module introduces students to a systematic way of reading bar graphs to extract the greatest amount of accurate information in the least possible period of time. Reading a graph accurately is a basic skill required of anyone working in the social studies and has become a basic skill required of a literate member of American society. This module provides students with a systematic format for developing this skill using graphs showing automobile prices.

Description of Materials

Courses and Topics:

Applicable to all courses in the Social Studies that use bar graphs.

Grade Level: 7-12.

Time Required: Once class period.

Concepts and Skills:

Social Studies Concepts: Prices and population.

Quantitative Concepts: Graphs (bar).

Thinking Skills: Interpreting and analyzing.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Read data presented in a bar graph.
2. Interpret data presented in a bar graph.

Sources of Data:

1. The Ford Dealers Association of Denver, Colorado was the source of price information on automobiles presented in this module.
2. Population projections by the Population Division of the United Nations were the source of projected city sizes (for the year 2,000) around the globe presented in this module.

LESSON 1: COMPARING PRICES

Introducing the Lesson

1. Distribute copies of "Ford Runabout" (Student Materials #1), or make a transparency to use with an overhead projector. Inform students that the Model T Ford Runabout was the lowest priced Ford produced in 1924. Ask students the following questions:

   --What was the lowest priced Ford produced in 1978? What did it cost? Pinto Pony 2 door Sedan with a base price of approximately $3,200.

   --What would a 1924 Model T Ford sell for as an antique car today? An authentically restored 1924 Runabout would today sell for between $6,000 and $7,000.

Developing the Lesson

2. Distribute "Changing Prices," (Student Materials #2) and allow students a few minutes to look at it. Focus on the following questions:

   --What was the base price of a Ford in 1910? 1940? 1970? 1910-$650, 1940-$700, 1970-$2,450.

   --What were the price changes on low-priced Fords from 1910 to 1940 and from 1940 to 1970? $50 between 1910 and 1940 and $1,750 between 1940 and 1970.

   --How much larger (proportionally) was the base price of a low-priced Ford in 1970 than in 1910? Approximately four times as large.

   The bars (money bags) do not reflect reality. The 1970 bag is not only four times as high but also four times as wide--giving a visual impression of an amount eight times as large rather than merely four times as large. Anytime figures, rather than bars, are used in such a graph the reader should beware of this type of illusion that misrepresents the facts.

Concluding the Lesson

3. On the student handout have students draw in bar (lines) to represent prices. Note how this lessens the dramatic and illusory impact previously given by the money bags. Emphasize that bars more closely represent the data (prices) that we want to present in the graph.

LESSON 2: COST OF A CAR

Introducing the Lesson

1. Distribute "Cost of a Car" (Student Materials #3) and have students complete the worksheet accompanying the bar graph.

Developing the Lesson

2. Verify students' answers to the worksheet.

   --Title, "Costs of Fords: 1905-1978".

   --Source, none is given.

   --Horizontal axis, Time.

   --Vertical axis, Base price in dollars.

   --1946 and 1978.

   --1925.

   --1978.

   --Slightly under $600. Actually, a decrease in price.

3. Inform students that there is a systematic way to read bar graphs that they should always follow. A useful way to read a graph is to identify:

   --The title of the graph.

   --The source of the information presented.

   --The footnotes to the graph.

   --The headings (name or label) of the vertical and horizontal axes of the graph.

   --The units of measure used in the graph.

   --Any variability (major trends or discrepancies) in the data that may be readily noted.

4. Distribute "Bar Graphs" (Student Materials #4). Have students read it and then briefly summarize for them:

   --Title. A good title should state precisely what the graph contains. The title of this graph covers the costs of Fords for a span of time between 1905 and 1978.

   --Source. The graph is deficient because it does not tell us the source of the information being presented. We need to know the source to be able to judge how reliable the information might be. It would also be useful to know when, how, and by whom the information was actually gathered.

   --Footnotes. Footnotes supply additional information that we may need to know to read the graph accurately. In this graph the footnotes explain that two reported years (1946 and 1978) differ from the other reported years in not following at 5 year intervals. These footnotes are deficient because they do not specify the cars to which the base price applies. The reader might think that this is an "average" base price for all models of Ford produced in the reported years. Actually, the reported base price is the price of the lowest priced model produced in each reported.

   --Headings. The headings of the vertical and horizontal axes provide additional detail on the exact type of information being presented in the graph. The headings in this graph inform us that we are dealing with the base price (in dollars) of selected model years.

   --Units of measure. Graphs are frequently misread because people do not identify the precise type of data being presented. In the graph each bar represents a dollar figure for the base price of Fords at five year intervals.

   --Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending on the task at hand, the reader will take a more detailed look at the data in order to answer specific questions about it.

One difficulty in taking an in-depth look at the data is that it is hard to judge exact prices from the height of the bars. This problem may be overcome by placing the exact price inside each bar. For example, in the bar for 1905 we would place $950--The price of the Ford Model C that year.

Concluding the Lesson

5. Identify for students some of the advantages and disadvantages of presenting information in graphs, including:

   --Clarity. Graphs can present a large amount of information in an orderly, standard format.

   --Economy. Graphs present information in a format that economizes on the use of space and words.

   --Information. Graphs provide a summation of information upon which are based the statements and conclusions found in the text.

   --Understanding. Graphs may make it easier to compare information and to understand quickly some of the implications of the information.

   --Appeal. Graphs may appear foreboding or dificult to the uninitated reader, so they are often ignored and their usefulness lost.

   --Acceptance. There is a tendency by too many people to accept as unquestionable fact anything presented in numerical or graph form, so readers may accept information in graphs without critical thought.

6. Suggest that any way of presenting information will have both advantages and disadvantages. If we understand this we can take a data presentation and attempt to maximize its strengths and minimize its weaknesses when we use it.

7. Divide the class into small groups and give each group a copy of "Growing Cities" (Student Materials #5). Allow each group to construct a bar graph with the data. Share the results and discuss any problems students had in constructing their bar gaaph. For example, a source is given but not the year in which the projections were made.

The two axes will be the names of the cities and the population size in millions. It would be appropriate to use either axis for either set of data.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. There is a systematic sequence, a useful way, to read a graph: the title, source, footnotes, axes (horizontal and vertical), headings, units of measure, and variability.

2. The strengths of presenting information in a graph include clarity and economy of presenting information in a readily understandable and comparable form.

3. The weaknesses of presenting information in a graph include both a fear of graphs by some people or too ready acceptance of any information presented in numerical or graph form.

ADDITIONAL ACTIVITIES

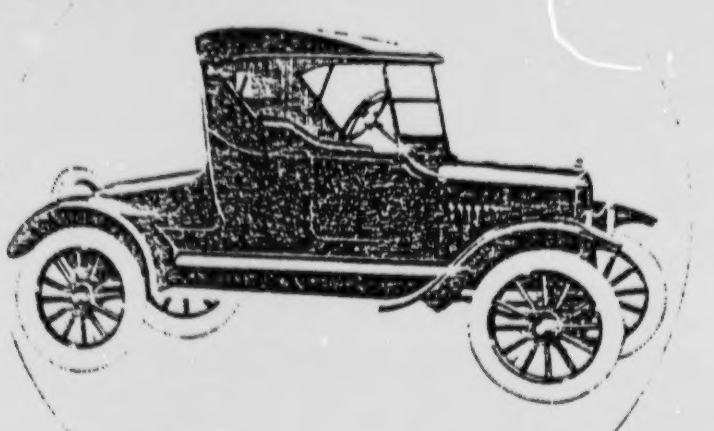
1. Provide additional bar graphs from other sources, such as the course text, and have students discuss their strengths and weaknesses.

ADDITIONAL ACTIVITIES

1. Provide additional bar graphs from other sources, such as the course text, and have students discuss their strengths and weaknesses.

BEST COPY AVAILABLE

Ford
RUNABOUT



$265 [illegible]

[illegible]

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Each spring the demand for Ford Runabouts is far in excess of the immediate supply.

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Detroit Michigan

See the Nearest Authorized Ford Dealer

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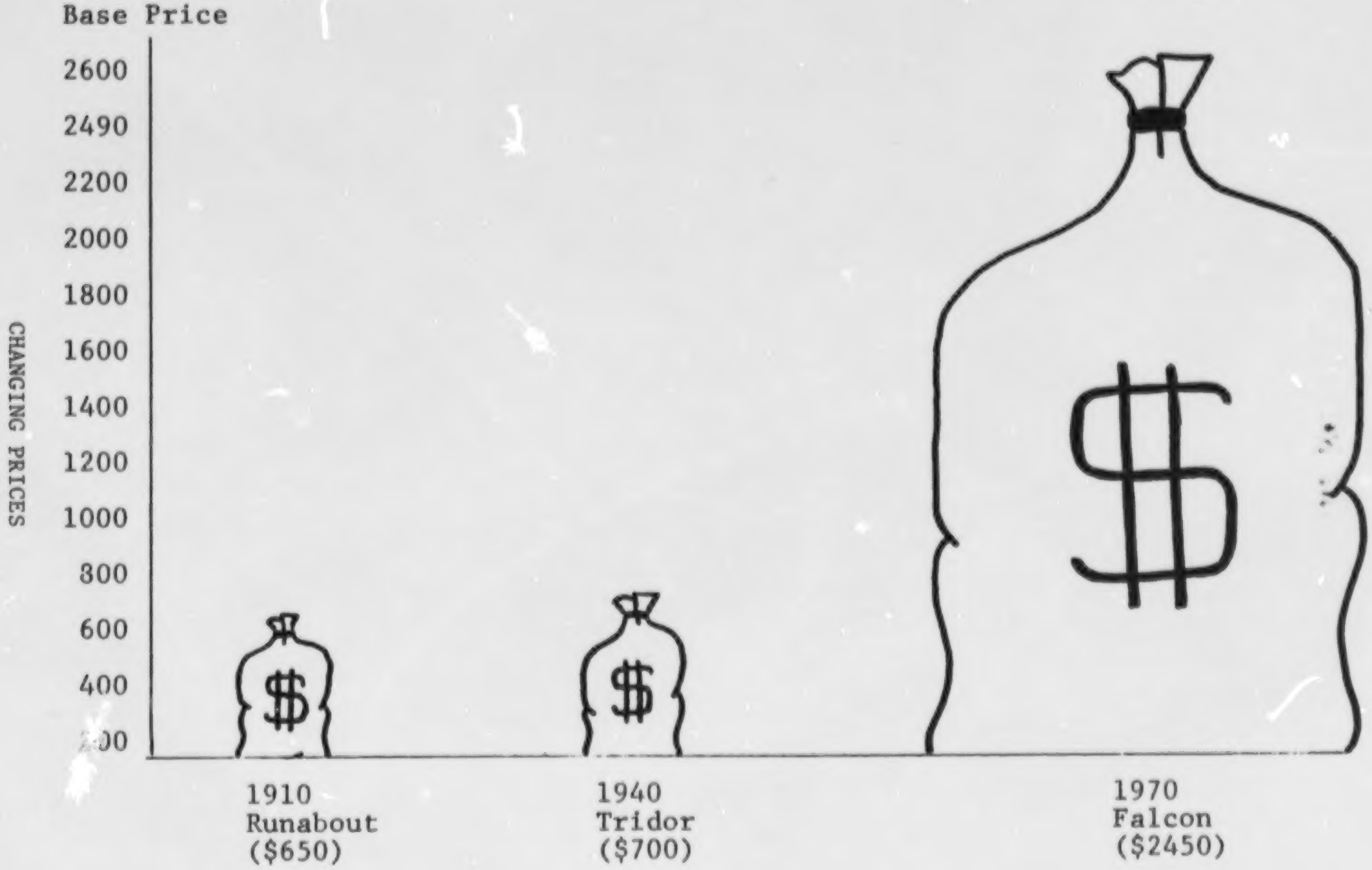
CARS · TRUCKS · TRACTORS

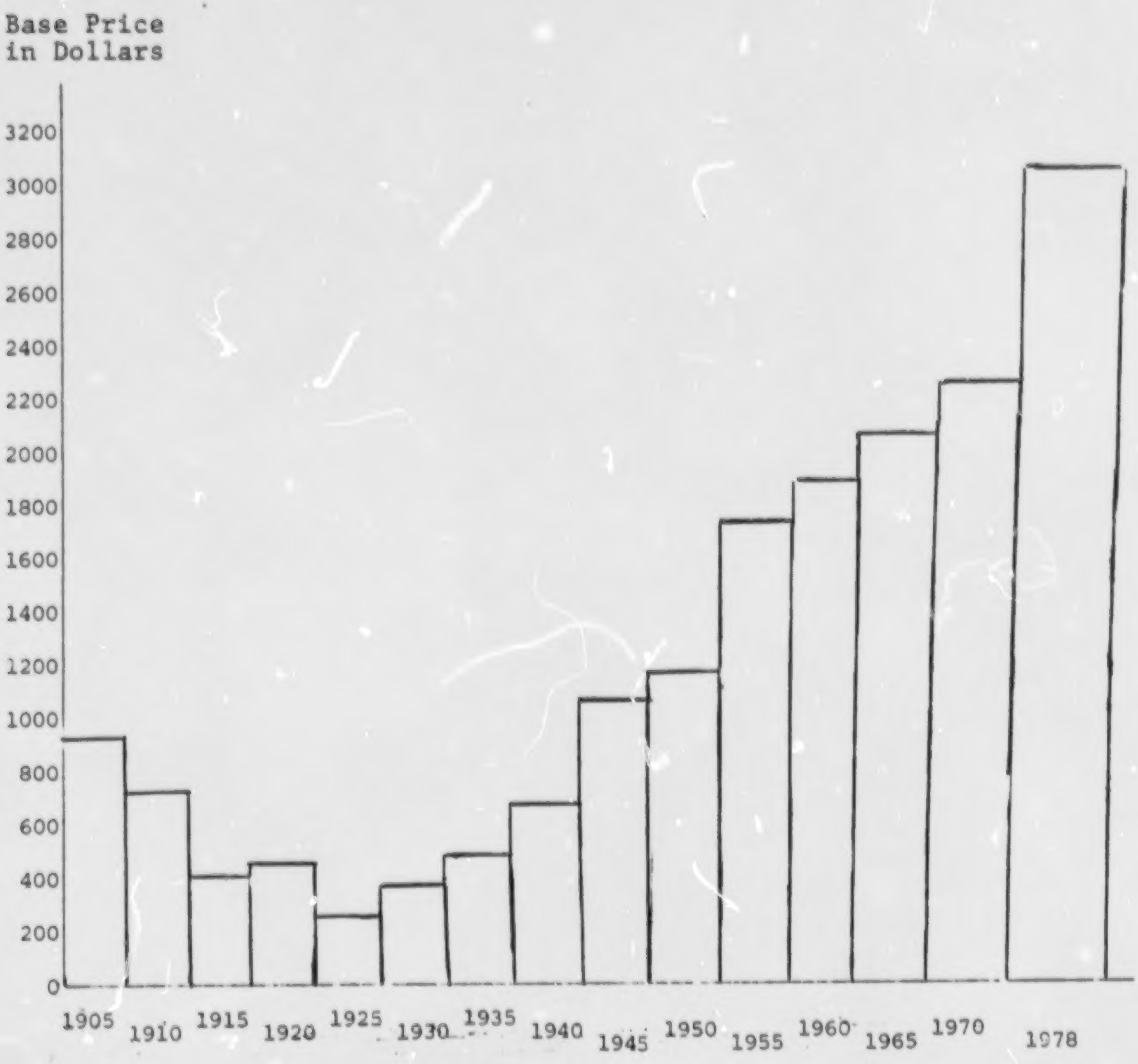
CHANGING PRICES



READING A BAR GRAPH STUDENT MATERIALS #3

COST OF A CAR

Costs of Fords: 1905-1978



*1946 is reported. In 1945 Ford was still producing military vehicles rather than passenger cars. 1970-78 is an eight year rather than a five year period, allowing a report of a recent sale year.

WORKSHEET

1. What is the title of the graph? ______________________ .

2. What is the source of information presented in the graph? ____

3. What is the title of the horizontal axis? ___________ .

4. What is the title of the vertical axis? _____________ .

5. Which two time periods shown in the graph do not cover spans as the other time periods? ____________ and ______________________ .

6. In which year was the lowest priced Ford produced? ______________________________ .

7. In which year was the most costly of these Fords produced? ______________________ .

8. Approximately what is the difference (dollars amount) between a Ford produced in 1905 and one produced in 1920? _________________________________ .

BAR GRAPHS

A useful way to read a bar graph is:

1. Title. A good title should state precisely what the graph contains. The title of this graph is acceptable because it tells us that the graph covers the costs of Fords for a span of time between 1905 and 1978.

2. Source. The graph is deficient because it does not tell us the source of the information being presented. We need to know the source to be able to judge how reliable the information might be. It would also be useful to know when, how, and by whom the information was actually gathered.

3. Footnotes. Footnotes supply additional information that we may need to know to read the graph accurately. In this graph the footnotes explain that two reported years (1946 and 1978) differ from the other reported years in not following at 5 year intervals. These footnotes are deficient because they do not specify the cars to which the base price applies. The reader might think that this is an "average" base price for all models of Ford produced in the reported year. Actually the reported base price is the price of the lowest priced model produced in each reported year.

4. Headings. The headings of the vertical and horizontal axes provide additional detail on the exact type of information being presented in the graph. The headings in this graph inform us that we are dealing with the base price (in dollars) of selected model years. Units of measure. Graphs are frequently misread because people do not identify the precise type of data being presented. In the graph, each bar represents a dollar figure for the base price of Fords at five year intervals.

5. Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending on the task at hand, the reader will take a more detailed look at the data in order to answer specific questions about it.

GROWING CITIES

Listed bleow are the 15 most populous urban areas in the year 2,000 based upon projections made by the Population Division of the United Nations.

1.	Buenos Aires	13,978,000
2.	Cairo-Giza Imbaba	16,398,000
3.	Calcutta	19,663,000
4.	Djakarta	16,933,000
5.	Greater Bombay	19,065,000
6.	Karachi	15,862,000
7.	Los Angeles-Long Beach	14,795,000
8.	Mexico City	31,616,000
9.	New York-northeastern New Jersey	22,212,000
10.	Peking	19,064,000
11.	Rio de Janeiro	19,383,000
12.	Sao Paulo	26,045,000
13.	Seoul	18,711,000
14.	Shanghai	19,155,000
15.	Tokyo-Yokohama	26,128,000

READING A LINE GRAPH

A module for teaching secondary
students to read and understand
information presented in line graphs.

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

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Student Materials

1. Sports Records
2. Unemployment in America
3. Line Graphs

OVERVIEW OF THE MODULE

Introduction

Graphs presenting summarized information are encountered frequently in textbooks, government publication, newspapers, magazines, business documents, and many other sources. Graphs are commonly used as a means of displaying a large amount of information in a concise, readable form. This module introduces students to a systematic way of reading line graphs to extract the greatest amount of accurate information in the shortest possible period of time. Reading a graph accurately is a basic skill required of anyone working in the social studies and has become a basic skill required of a literate member of society. This module provides students with a systematic format for developing this skill using graphs showing world records in sports.

Description of Materials

Courses and Topics:

Applicable to all courses in the Social Studies that use line graphs.

Grade Level: 7-12.

Time Required: One class period.

Concepts and Skills:

Social Studies Concepts: Unemployment patterns and sports.

Quantitative Concepts: Graphs (line).

Thinking Skills: Interpreting and analyzing.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Read data presented in a line graph.
2. Interpret data presented in a line graph.

Sources of Data:

1. The 1977 edition of the Statistical Abstract of the United States and the Historical Statistics of the United States were the sources of information on unemployment presented in this module. Both sources are published by the Bureau of the Census, U.S. Department of Commerce.

LESSON 1: RECORD BREAKING

Introducing the Lesson

1. Distribute copies of "Sports Records" (Student Materials #1), or make a transparency to use with an overhead projector.

2. Stimulate student reaction by asking:

   --Which records show the most dramatic changes? Why? Actually, they show the same type of change over the same time periods. Both graphs cover men and women freestyle world swimming records from 1950 to 1978.

Developing the Lesson

3. Elicit from students the differences in the two line graphs by asking the questions:

   --What items (in seconds) are covered by the two graphs? The first graph covers 0-65 seconds whereas the second graph covers only 49-60.5 seconds. In effect, the bottom 2/3 of the second graph is missing.

   --What time intervals (in seconds) are covered by the two graphs? The first graph records record times at 5 second intervals whereas the second graph records the record times at ½ second intervals. In effect, we have stretched or lengthened the 1/3 section of our graph to make the declining swimming records appear more dramatic.

   --Are such tricks acceptable behavior? Neither of the above is illegal, but they certainly may be tricky maneuvers. It would be even trickier to shorten the horizontal axes and make the graph even more dramatic.

Concluding the Lesson

4. Suggest that graphs are a useful way of presenting information. However graphs can be used, as can words or other means, in a way which may (intentionally or unintentionally) mislead. To avoid being misled, we need to be able to read and interpret graphs accurately.

LESSON 2: UNEMPLOYMENT IN AMERICA

Introducing the Lesson

1. Distribute "Unemployment in America" (Student Materials #2) and have students complete the worksheet accompanying the line graph.

Developing the Lesson

2. Verify students' answers to the worksheet.

   --Title, "U.S. Unemployment Rates: 1890-1976".

   --Source, *Statistical Abstract 1977* and *Historical Statistics of the United States*.

   --Time period, 1890-1976.

   --Information, unemployment among the civilian labor force.

   --Measure, percentage across time.

   --Time intervals, 5 year intervals.

   --Highest unemployment, late 1930's--due to the global depression.

   --Lowest unemployment, 1945--due to World War II.

   --Trends, we don't have enough information to predict anything other than the probability of continued fluctuation in the unemployment rate.

3. Inform students that there is a systematic way to read line graphs that they should always follow. A useful way to read a graph is to identify:

   --The title of the graph.

   --The source of the information presented.

   --The footnotes to the graph.

   --The headings (name or label) of the vertical and horizontal axes of the graph.

   --The units of measure used in the graph.

--Any variability (major trends or discrepancies) in the data that may be readily noted.

4. Distribute "Line Graphs" (Student Materials #3). Have students read it and then briefly summarize for them:

--Title. A good title should state precisely what the graph contains. The title of this graph is acceptable because it tells us that it covers unemployment rates in the U.S. between 1890 and 1976.

--Source. Knowing the source of information presented in the graph enables us to judge how reliable the data may be. It would also be useful to know exactly when, how, and by whom the information was actually gathered.

--Footnotes. Footnotes supply additional information that we need to know to read the graph accurately. In this graph the footnotes explain that the unemployment rate refers to civilians who are 16 years of age or older.

--Headings. The headings of the vertical and horizontal axes provide additional detail on the exact type of information being presented in the graph. The headings in this graph inform us that we are dealing with the percentage unemployed for ten year intervals between 1890 and 1976.

--Units of Measure. Graphs are frequently misread because people do not identify the precise type of data being presented. In this graph the fluctuations in unemployment might not appear as dramatic if the top 3/4 of the graph (25% to 100%) were not missing.

--Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending on the task at hand, the reader will take a more detailed look at the data in order to answer specific questions about it.

Concluding the Lesson

5. Identify for students some of the advantages and disadvantages of presenting information in graphs, including:

   --Clarity. Graphs can present a large amount of information in an orderly, standard format.

   --Economy. Graphs present information in a format that economizes on the use of space and words.

   --Information. Graphs provide a summation of information upon which are based the statements and conclusions found in the text.

   --Understanding. Graphs may make it easier to compare information and to understand quickly some of the implications of the information.

   --Appeal. Graphs may appear foreboding or difficult to the uninitated reader, so they are often ignored and their usefulness lost.

   --Acceptance. There is a tendency by too many people to accept as unquestionable fact anything presented in numerical or graph form, so readers may accept information in graphs without critical thought.

6. Suggest that any way of presenting information will have both advantages and disadvantages. If we understand this we can take a data presentation and attempt to maximize its strengths and minimize its weaknesses when we use it.

7. Divide the class into small groups. Have some groups redraw the graph on U.S. Unemployment Rates using 0%-100% on the vertical axis. Have other groups redraw the graph using 0%-25% but with 1 point each to the vertical scale rather than the 2½ points used in the student handout. Compare the three versions of the same data.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. There is a systematic sequence, a useful way, to read a graph: the title, source, footnotes, axes (horizontal and vertical) headings, units of measure, and variability.
2. The strengths of presenting information in a graph include clarity and economy of presenting information in a readily understandable and comparable form.
3. The weaknesses of presenting information in a graph include both a fear of graphs by some people or too ready acceptance of any information presented in numerical or graph form.

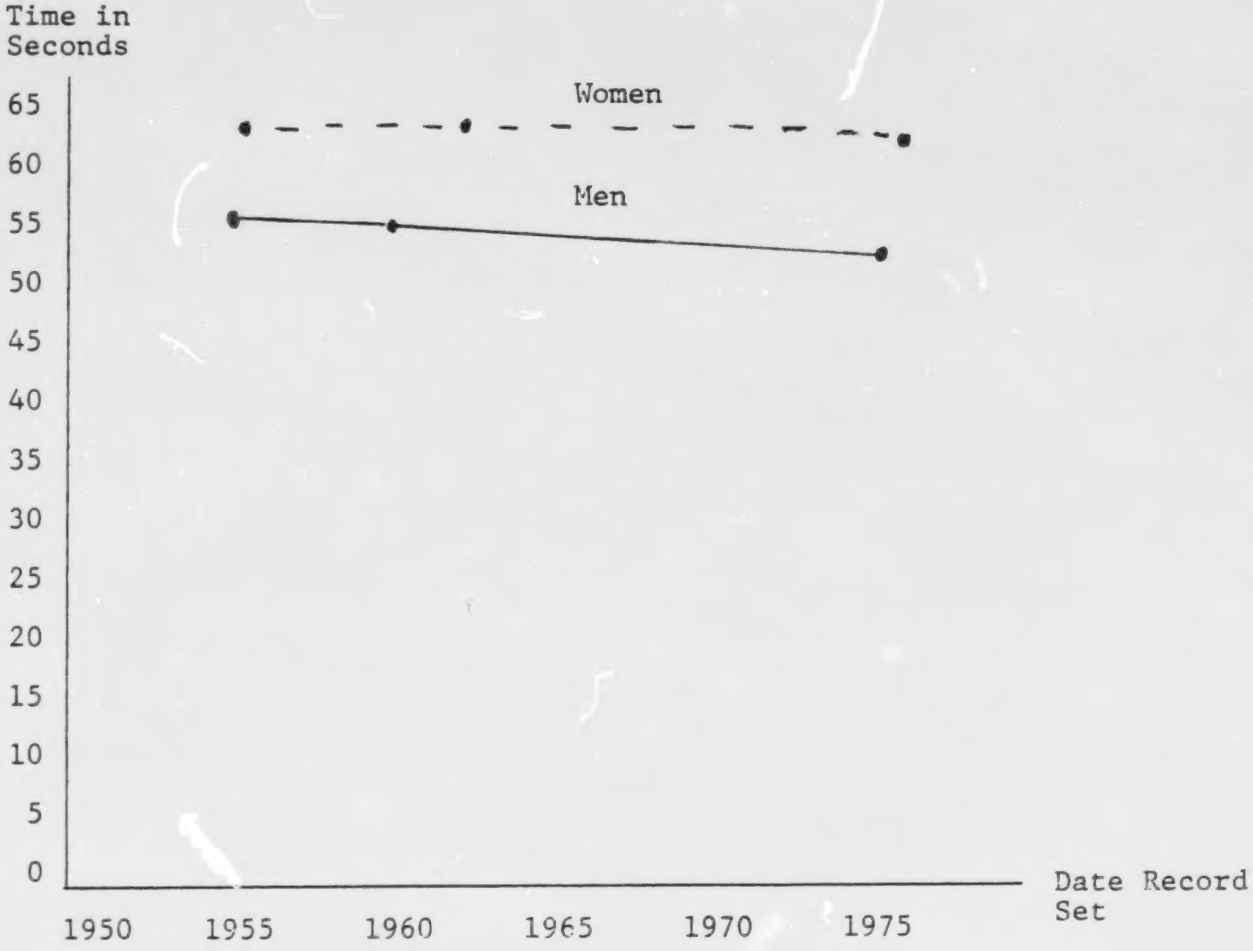
ADDITIONAL ACTIVITIES

1. Provide additional line graphs from other sources, such as the course text, and have students discuss their strengths and weaknesses.
2. Have students conduct a scavenger hunt for examples of the use of line graphs in various sources--texts, newspapers, magazines, etc. What topics are covered by line graphs in these sources?

SPORTS RECORDS

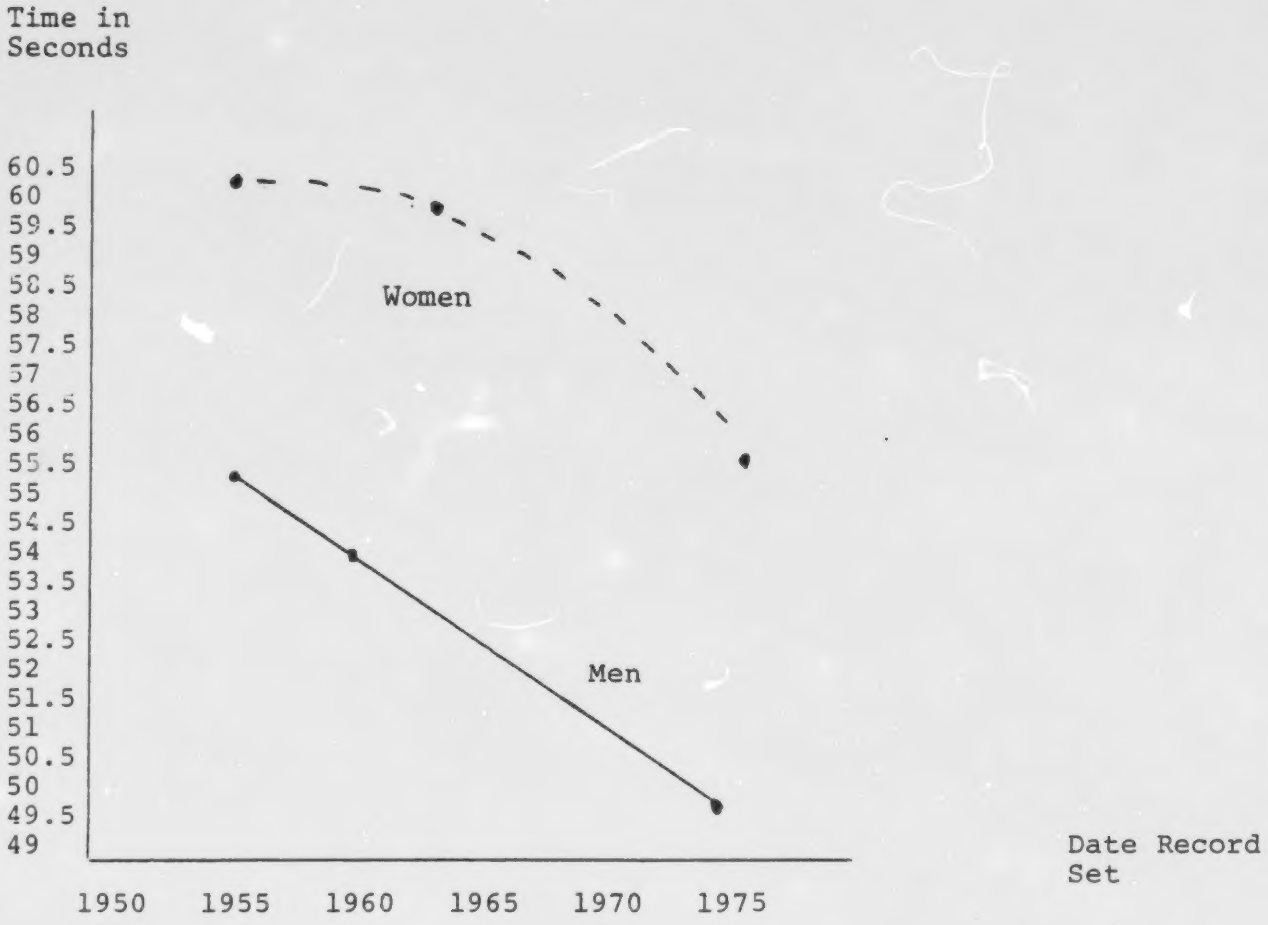
World Records in Swimming

(100 Meter Freestyle)



WORLD RECORDS IN SWIMMING

(100 Meter Freestyle)

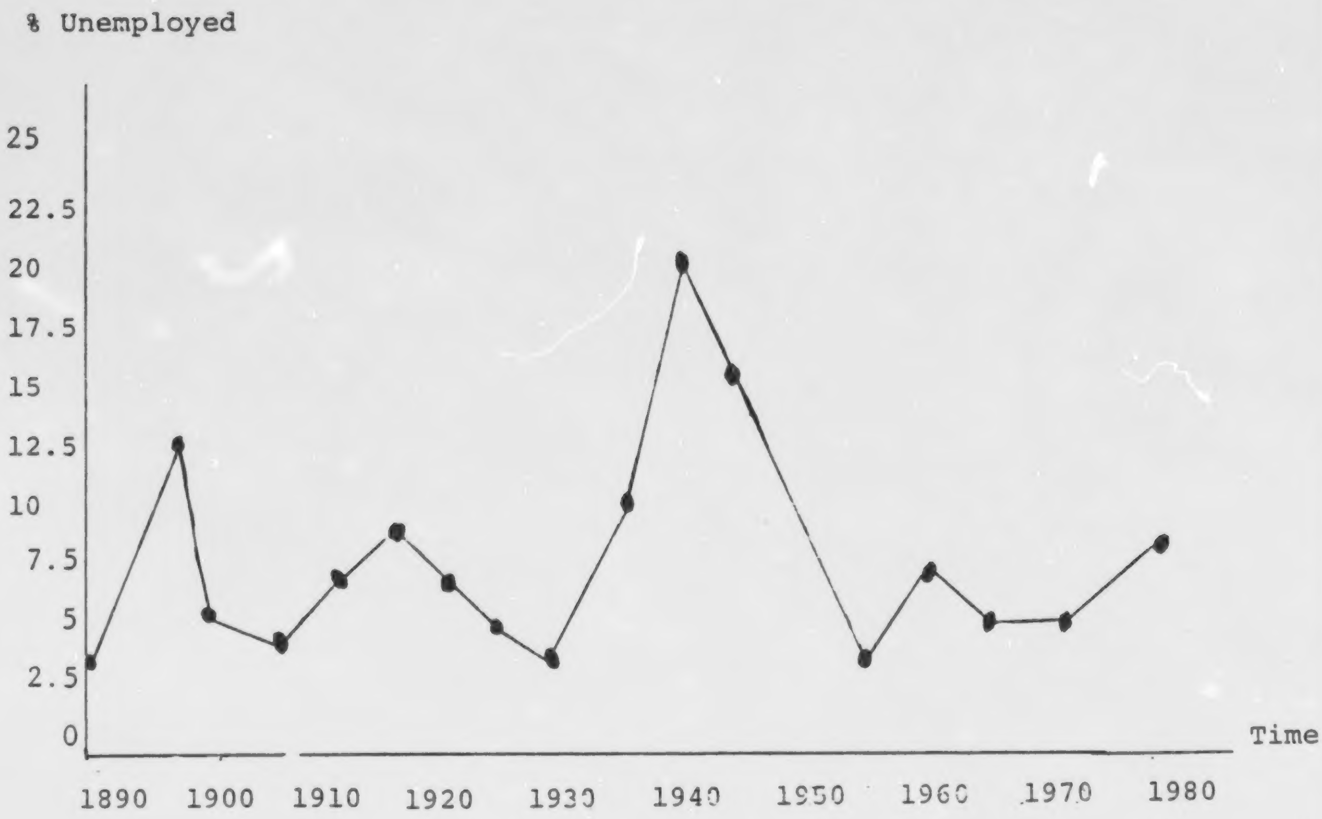


READING A LINE GRAPH STUDENT MATERIALS #2

UNEMPLOYMENT IN AMERICA

U.S. Unemployment Rates

(1890-1976)



Percentage of the U.S. civilian labor force unemployed, 1890-1976. Covers persons 16 years old and over.

Source: Historical Statistics of the U.S. p. 135, Statistical Abstract, 1977, p. 395.

WORKSHEET

1. What is the title of the graph? ______________________

   ____

2. From where did the information in the graph come?

   ____

   ____

3. What is the total time period (years) covered by the graph? ____

4. What information does the graph present? ______________

   ____

5. What type of measure is reported in the graph? ________

   ____

6. What time intervals are reported in the graph? _________

   ____

7. At which point in time did the U.S. have the highest unemployment rate? _______________________________________

   Do you know the major reason why? ______________________

8. At which point in time did the U.S. have the lowest unemployment rate? _______________________________________

9. Based on past trends, what can we predict for the future?

   ____

   ____

LINE GRAPHS

A useful way to read a line graph is:

1. Title. A good title should state precisely what the graph contains. The title of this graph is acceptable because it tells us that it covers unemployment rates in the U.S. between 1890 and 1976.

2. Source. Knowing the source of information presented in the graph enables us to judge how reliable the data may be. It would also be useful to know exactly when, how, and by whom the information was actually gathered.

3. Footnotes. Footnotes supply additional information that we need to know to read the graph accurately. In this graph the footnotes explain that the unemployment rate refers to civilians who are 16 years of age or older.

4. Headings. The headings of the vertical and horizontal axes provide additional detail on the exact type of information being presented in the graph. The headings in this graph inform us that we are dealing with the percentage unemployed for ten year intervals between 1890 and 1976.

5. Units of Measure. Graphs are frequently misread because people do not identify the precise type of data being presented. In this graph the fluctuations in unemployment might not appear as dramatic if the top 3/4 of the graph (25% to 100%) were not missing.

6. Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending on the task at hand, the reader will take a more detailed look at the data in order to answer specific questions about it.

READING A CIRCLE GRAPH

A module for teaching secondary students
to read and understand information
presented in circle graphs.

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

This teaching module was developed by a project of the Educational Resources Center entitled Quantitative Understanding to Enhance Social Science Teaching (QUESST). This module is an experimental edition and may not be reproduced or used in any manner without the specific written approval of Project QUESST.

This material is based upon research supported by the National Science Foundation under Grant No. SED77-18598. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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2. Washington Spends Our Dollars
3. Where We Live

OVERVIEW OF THE MODULE

Introduction

Graphs presenting summarized information are encountered frequently in textbooks, government publications, newspapers, magazines, business documents, and many other sources. Graphs are commonly used as a means of displaying a large amount of information in a concise, readable form. This module introduces students to a systematic way of reading circle graphs to extract the greatest amount of accurate information in the least possible period of time. Reading a graph accurately is a basic skill required of anyone working in the social studies and has become a basic skill required of a literate member of American society. This module provides students with a systematic format for developing this skill using graphs showing criminal categories and government budgets.

Description of Materials

Courses and Topics:

Applicable to all courses in the Social Studies that use circle graphs.

Grade Level: 7-12.

Time Required: One class period.

Concepts and Skills:

Social Studies Concepts: Crime patterns and federal budgets.

Quantitative Concepts: Graphs (circle).

Thinking Skills: Interpreting and analyzing.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Read data presented in a circle graph.
2. Interpret data presented in a circle graph.

Sources of Data:

1. The 1976 edition of the Uniform Crime Report was the source of information on crime presented in this module. The Report is published annually by the Federal Bureau of Investigation.
2. The 1977 edition of the Statistical Abstract of the United States is the source of information on U.S. Government budgets presented in this module. The Abstract is published annually by the Bureau of the Census, Department of Commerce.

LESSON 1: CRIME IN AMERICA

Introducing the Lesson

1. Distribute copies of "Crime Wave" (Student Materials #1), or make a transparency to use with an overhead projector.

2. Stimulate student reaction by stating that the crime wave in America, as indicated by the frequency of occurrence, is a major societal problem and that it is all the fault of the males in our society, as the circle graphs prove.

Developing the Lesson

3. Elicit student responses to the introductory statement. Responses might include:

   --Males are not the only ones to commit crimes.

   --Males, in all seven categories, commit more crimes than females.

   --The proportion of crimes committed by males range from a low of 68.8% to a high of 99.1%.

   --What about other types of crimes--like child beating?

   --How old is the data?

   --Does the data cover only one year or a number of years?

   --Who collected the data?

4. In answer to some questions which might arise, these are the seven crime categories for which nation-wide data is collected and reported annually by the FBI. The data in the student handout was taken from the 1976 edition of the Uniform Crime Report of the FBI.

Concluding the Lesson

5. As a point of interest, note that while males today commit a higher proportion of all crimes the rate of increase of crimes committed is often highest for females. In a sense, females will be catching up with males in some crime categories. On the chalkboard note the following percentage changes in the number of crimes committed by males and females between 1967 and 1976.

Crime Category	Males	Females
1. Larceny Theft	+72%	+156%
2. Burglary	+52%	+104%
3. Auto Theft	-19%	+ 41%
4. Assault	+59%	+ 78%
5. Robbery	+86%	+183%
6. Rape	+69%	-
7. Murder	+57%	+30%

6. Suggest that graphs are a useful way of presenting information. Circle graphs are an especially useful way of displaying data that involves proportions and percentages. Note that circle graphs can be used to indicate proportions for two points in time, as shown in the next lesson.

LESSON 2: SPENDING OUR DOLLARS

Introducing the Lesson

1. Distribute "Washington Spends Our Dollars" (Student Materials #2) and have students complete the worksheet accompanying the circle graphs.

Developing the Lesson

2. Verify students' answers to the worksheet.

   --Title,"U.S. Government Spending."

   --Source, Statistical Abstract 1977.

   --Time period, 1960 and 1977.

   --Information, Government spending by categories--percent or proportion.

   --Measure, percent or proportion of the budget dollar.

   --Highest 1977 measure, Income Security --33.6%.

   --Lowest 1960 measure, Health--0.8%.

   --Income Security, 1960--19.8%, 1977--33.6%.

   --Education, 1960 to 1977 increase was 3.9%.

3. Inform students that there is a systematic way to read circle graphs that they should always follow. A useful way to read a graph is to identify:

   --The title of the graph.

   --The source of the information presented.

   --The footnotes to the graph.

   --The units of measure used in the graph. This will be percentage or proportion but the reader should identify percentage of what--a population size, a dollar figure, etc.

--Any variability (major differences) in the data that may be readily noted. This may be differences between the same category in a graph at two different points in time.

4. Distribute "Circle Graphs" (Student Materials #3). Have students read it and then briefly summarize for them:

- Title. A good title should state precisely what the graph contains. The title of this graph should have contained the dates 1960 and 1977 to make the title complete.

--Source. The source fails to tell us who puts out the Statistical Abstract. It is published annually by the Bureau of the Census, Department of Commerce. Knowing the source of information presented in the graph enables us to judge how reliable the data may be.

--Footnotes. These supply additional information that we may need to know to read the graph accurately. Footnotes which this graph should have included are: First, the graph contained percent distribution of government spending by budget categories. Secondly, the data for 1977 was an estimate based on the first six months of the year. Third, the category of "Other" includes agriculture, foreign affairs and foreign aid, the space program, scientific research, and law enforcement. Lastly, the "Income Security" category includes retirement, disability, public assistance, and other income supplemental programs.

--Units of measure. Graphs are frequently misread because people do not identify the precise type of data being presented. Circle graphs present a percentage or proportion of some whole but the reader must be sure to identify what that whole is. In this case we are looking at the percentage of the budget dollar spent on different types of programs. What is lacking is a note telling the reader the total budget for each of the two time periods which would allow a more detailed comparison. For example, the 1977 budget for national defense is approximately half of the 1960 budget (25% vs. 49%) by proportion. However, the 1977 budget is larger and the actual number of dollars spent on national defense in 1977 could be as large as or larger than the total amount spent in 1960.

With our graph however we can't tell because we don't have the actual dollar figures.

--Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending on the task at hand, the reader will take a more detailed look at the data in order to answer specific questions about it.

Concluding the Lesson

5. Identify for students some of the advantages and disadvantages of presenting information in graphs, including:

--Clarity. Graphs can present a large amount of information in an orderly, standard format.

--Economy. Graphs provide a summation of information upon which are based the statements and conclusions found in the text.

--Understanding. Graphs may make it easier to compare information and to understand quickly some of the implications of the information.

--Appeal. Graphs may appear foreboding or difficult to the uninitiated reader, so they are often ignored and their usefulness lost.

--Acceptance. There is a tendency by too many people to accept as an unquestionable fact anything presented in numerical or graph form, so readers may accept graphs without critical thought.

6. Suggest that any way of presenting information will have both advantages and disadvantages. If we understand this we can take a data presentation and attempt to maximize its strengths and minimize its weaknesses when we use it.

7. Divide the class into small groups and have them construct two circle graphs (1920 and 1970) from the data given in "Where We Live" (Student Materials #4). Have the groups share their ideas for a title, information to put in footnotes, and other information needed such as a definition of the four regions.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. There is a systematic sequence, a useful way, to read a graph: the title, source, footnotes, axes (horizontal and vertical), headings, units of measure, and variability.
2. The strengths of presenting information in a graph include clarity and economy of presenting information in a readily understandable and comparable form.
3. The weaknesses of presenting information in a graph include both a fear of graphs by some people or too ready acceptance of any information presented in numerical or graph form.

ADDITIONAL ACTIVITIES

1. Provide additional circle graphs from other sources, such as the course text, and have students discuss their strengths and weaknesses.
2. Have students conduct a scavenger hunt for examples of the use of circle graphs in various sources--texts, newspapers, magazines, etc. What topics are covered by circle graphs in these sources?

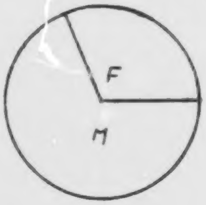
CRIME WAVE

In order of the frequency of their occurrence, the crime pattern in America is:

1. Every 5 seconds--one larceny theft
2. Every 10 seconds--one burglary
3. Every 33 seconds--one motor vehicle theft
4. Every 64 seconds--one aggravated assault
5. Every 75 seconds--one robbery
6. Every 9 minutes--one forcible rape
7. Every 28 minutes--one murder

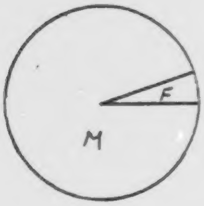
Proportionally, by sex of the offender, the crime pattern in America is:

1. Larceny Theft--



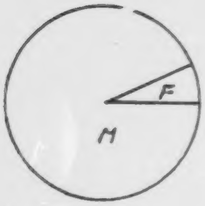
Male--68.8%, Female--31.2%

2. Burglary--



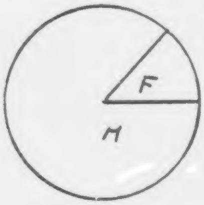
Male--94.8%, Female--5.2%

3. Auto Theft--



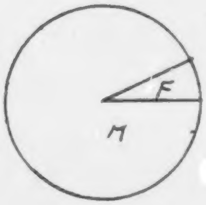
Male--93%, Female--7%

4. Assault--



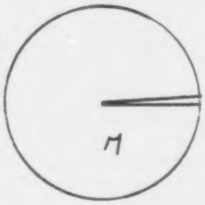
Male--86.9%, Female--13.1%

5. Robbery--



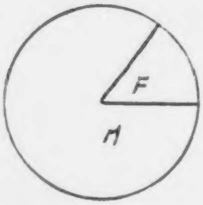
Male--92.9%, Female--7.1%

6. Rape--



Male--99.1%, Female--0.9%

7. Murder--



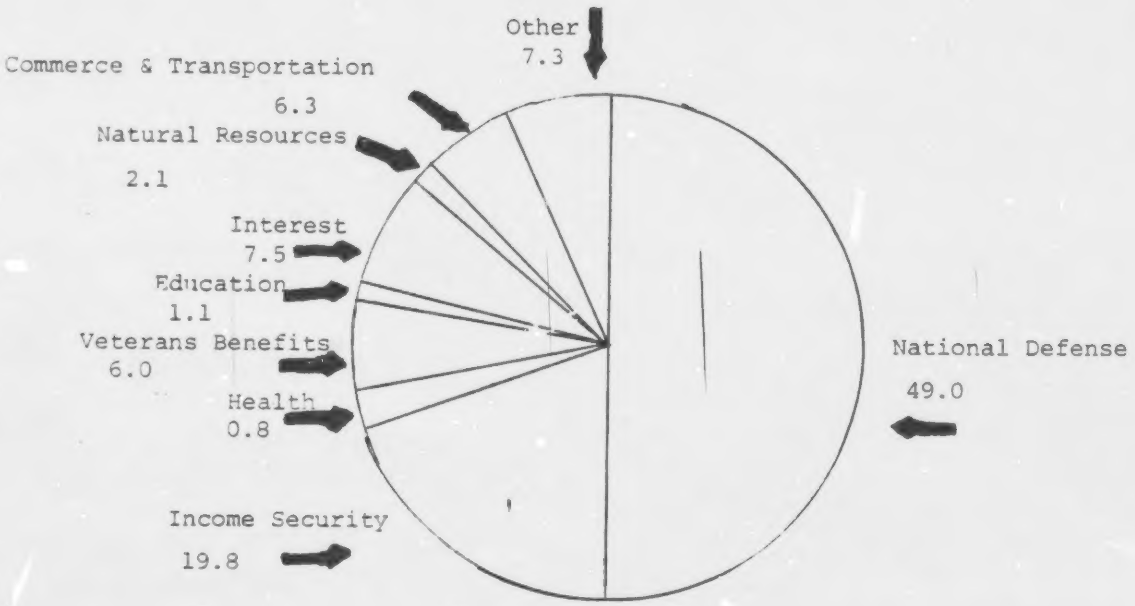
Male--85.1%, Female--14.9%

Source: Uniform Crime Report, 1976.

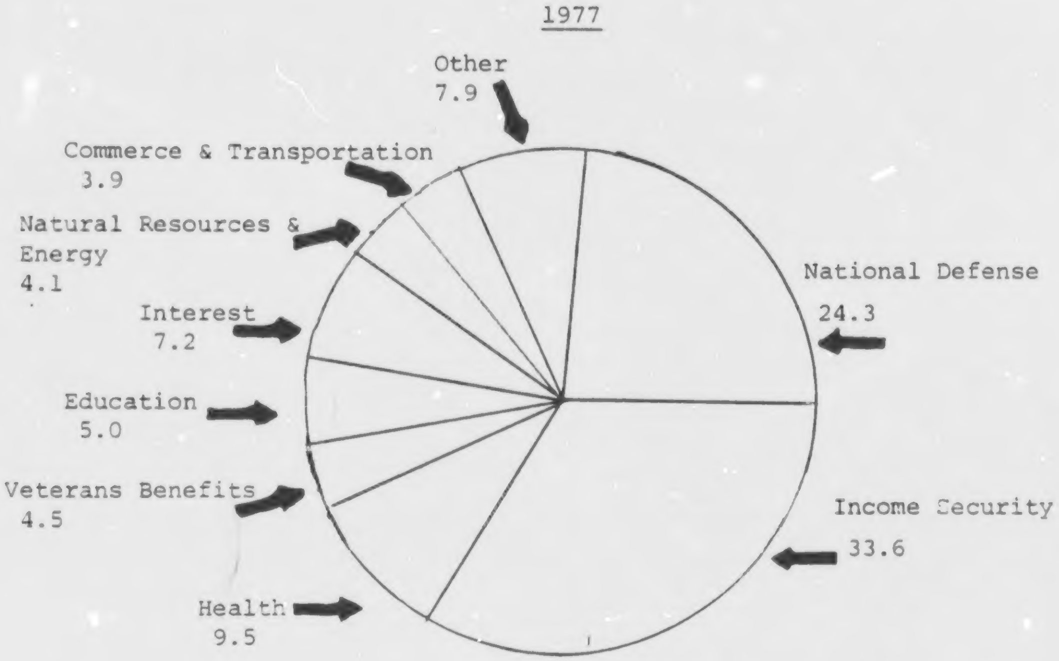
WASHINGTON SPENDS OUR DOLLARS

U.S. Government Spending

1960



Source: Statistical Abstract, 1977



Source: Statistical Abstract, 1977

WORKSHEET

1. What is the title of the circle graph? ____________________.
2. From where did the information presented in the graph come? ____
3. For what years is information presented? __________________
4. What information does the graph present? __________________
5. What type of measure is used in the graph? ________________ ____
6. What was the only expenditure category greater than National Defense in 1977? ________________________
7. What was the smallest expenditure category in 1960? ____
8. What percent of total U.S. government spending went for Income Security in 1960? in 1977? ______________________ ____
9. What was the proportional amount of increased spending on Education from 1960 to 1977? ________________________ ____

CIRCLE GRAPHS

A useful way to read a circle graph is:

1. Title. A good title should state precisely what the graph contains. The title of this graph should have contained the dates 1960 and 1977 to make the title complete.

2. Source. The source fails to tell us who puts out the Statistical Abstract. It is published annually by the Bureau of the Census, Department of Commerce. Knowing the source of information presented in the graph enables us to judge how reliable the data may be.

3. Footnotes. These supply additional information that we may need to know to read the graph accurately. Footnotes which this graph should have included are: First, the graph contained percent distribution of government spending by budget categories. Secondly, the data for 1977 was an estimate based on the first six months of the year. Third, the category of "Other" includes agriculture, foreign affairs and foreign aid, the space program, scientific research, and law enforcement. Lastly, the "Income Security" category includes retirement, disability, public assistance, and other income supplemental programs.

4. Units of measure. Graphs are frequently misread because people do not identify the precise type of data being presented. Circle graphs present a percentage or proportion of some whole but the reader must be sure to identify what that whole is. In this case we are looking at the percentage of the budget dollar spent on different types of programs. What is lacking is a note telling the reader the total budget for each of out two time periods which would allow a more detailed comparison. For example, the 1977 budget for national defense is approximately half of the 1960 budget (25% vs. 49%) by proportion. However, the 1977 budget is larger and the actual number of dollars spent on national defense in 1977 could be as large as or larger than the total amount spent in 1960. With our graph, however, we can't tell because we don't have any actual dollar figures.

5. Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending on the task at hand, the reader will take a more detailed look at the data in order to answer specific questions about it.

WHERE WE LIVE

Every year the Census Bureau, part of the United States Department of Commerce, publishes a national data book called the Statistical Abstract of the United States. The 1977 edition of the book in the chapter on population, presented some interesting information on where Americans live.

According to the U.S. Census Bureau, in 1920 some 28% of the American population lived in the northeast part of the country, 32% lived in the northcentral section of the U.S., 31% lived in the south, and only 9% of the people lived in the western United States. By the time the census count was taken in 1970, there had been some changes in where Americans live. By 1970 the proportion of the population living in the west had risen, from the 9% figure of 1920, to 17%. In the northeast in 1970, the proportion of the population was 24%. In 1970 some 28% of the population lived in the northcentral portion of the country and 31% still lived in the southern United States.

CONSTRUCTING AN INDEX

A module for presenting secondary students
with a process for constructing
and using an index.

Project QUESST
Boulder, Colorado
July, 1979

EXPERIMENTAL EDITION

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OVERVIEW OF THE MODULE

Introduction

An index is used to disclose the relative change, if any, of prices, cost, or some similar measure between one period of time and a second period of time selected as the base period. One of the most commonly used indexes in America is the Consumer Price Index (CPI), but index numbers have been applied to wages, interest rates, business activity, health costs, and industrial production.

Students may have heard of the CPI but do not know what it really means. This module will assist students in understanding what it means by showing them how to construct an index. The module will also enable students to interpret an index for a given period of time. Students should find this module particularly useful in understanding economic and social trends in our society and in deciding what kind of public policy may be most desirable for the nation at given points in time. The index used in this module will measure the rate of violent crime in the U.S. from 1967-1976.

Description of Materials

Courses and Topics:

Applicable to all courses in the Social Studies that use indexes as a form of presenting information.

Grade Level: 7-12

Time Required: One class period.

BEST COPY AVAILABLE

Concepts and Skills:

Social Studies Concepts: U.S. crime patterns.

Quantitative Concepts: Index numbers, graphs (line).

Thinking Skills: Interpreting.

Instructional Objectives:

At the conclusion of this module, students will be better able to:

1. Construct an index.
2. Interpret an index.

Sources of Data:

The 1977 edition of the Statistical Abstract of the U.S. was the source of information on violent crime presented in this module. It is published annually by the Bureau the Census, U.S. Department of Commerce.

LESSON 1: VIOLENT CRIME IN AMERICA

Introducing the Lesson

1. Distribute copies of "Violent Crime Rate per 100,000 Population, 1967-76" (Student Materials #1), or make a transparency to use with an overhead projector.

   NOTE: The "Total" column in student materials #1 has been left blank. Students will calculate the totals in step 4 below.

2. Stimulate student reaction by asking:

   --Has violent crime been increasing or decreasing since 1967? Increasing.

   --In each of the four categories of violent crime, were there any years that an increase in the rate of crime did not take place? Yes, robbery decreased in 1972 and 1976, and murder decreased in 1975 and 1976.

   --Can you estimate whether total violent crime increased or decreased from 1977 to 1978?

Developing the Lesson

3. Explain to students that we can measure certain changing conditions, like violent crime, by constructing an index. An index consists of several indicators or characteristics that can be added together to indicate a total magnitude of the whole. For example, an index of industrial production might break production down into numerous indicators, including automobiles, paper, aircraft, leather goods, etc. With a violent crime index, the indicators could be murder, forcible rape, robbery, and aggravated assault.

4. To construct an index of violent crime, inform students that we first must use the data from Student Materials #1 to find the total amount of violent crime per 100,000 population for each year from 1967-76. This can be found simply by adding together the figures for each indicator in a given year. Have students calculate these totals and record them in the appropriate column on the student materials.

NOTE: If the total amount is a decimal figure, round off to the nearest whole number.

Totals are:

1967--253
1968--299
1969--329
1970--364
1971--396
1972--402
1973--418
1974--461
1975--481
1976--460

5. Hand out "Violent Crime Index Graph" (Student Materials #2). Explain that the purpose of an index is to show changes from a base year or base period in terms of percentage change. In the construction of any index, the base period is assigned a value of 100. For the violent crime index, 1967 is used as the base period. We can assign the total amount of violent crime (per 100,000) for that year a value of 100. As figures are compiled for each year from 1967 to 1976, if the total amount of violent crime increases, the violent crime index will go above 100. If the total amount of violent crime decreases, the violent crime index will go below 100.

6. To measure the relative increase (decrease) in the index, students should take the following steps:

--Subtract 1967 total of violent crime (per 100,000) from 1968 total.

$$\begin{array}{r} 299 \\ -\underline{253} \\ 46 \end{array}$$

--Divide the difference by the total amount of violent crime for the base year 1967.
46 ÷ 253 = .1818 or 18%.

--Add 18 to the assigned value of 100 for the 1967 base year. 100 + 18 = 118 or the 1968 index number. Plot this figure on the graph.

--Subtract 1967 total of violent crime (per 100,000) from 1969 total.

$$\begin{array}{r} 329 \\ -\underline{253} \\ 76 \end{array}$$

--Divide the difference by the total amount of violent crime for the base year, 1967.
76 ÷ 253 = .300 or 30%.

--Add 30 to the assigned value of 100 for the 1967 base year so that 100 + 30 = 130 or the 1969 index number. Plot this figure on the graph.

Follow the same procedure for each succeeding year. Calculate the percentage change and plot it on the graph.

Answers are:

1967--base year of 100
1968--.181 or 18%=118 index number
1969--.300 or 30%=130
1970--.438 or 44%=144
1971--.565 or 57%=157
1972--.588 or 59%=159
1973--.652 or 65%=165
1974--.822 or 82%=182
1975--.901 or 90%=190
1976--.818 or 82%=182

Concluding the Lesson

7. Note that constructing an index is one way to measure and illustrate the relative change in violent crime over a given period to time. However, an index can be used, as can words or other means, in a way which may (intentionally of unintentionally) be misleading. To avoid being mislead, we need to be able to read and interpret an index accurately.

LESSON 2: INTERPRETING AN INDEX

Introducing the Lesson

1. Distribute "Worksheet - Violent Crime Index" (Student Materials #3). Have students fill in the correct answers based on the index graph (Student Materials #2) that they constructed in the previous lesson.

Developing the Lesson

2. Verify students' answers to the worksheet. Answers include:

   --Title, "Violent Crime Index."

   --Source, based on data from the U.S. Statistical Abstract 1977 published by the Bureau of the Census, Department of Commerce.

   --Time period, from 1967 to 1976.

   --Base year, 1967. Assigned value, 100.

   --Measures violent crimes over a ten year period.

   --Largest increase, 1968--18% increase.

   --Smallest increase, from 1971 to 1972--1% increase.

   --Decrease, 1976.

   --Total increase, 82 (from 100 to 182).

3. Inform students that finding answers to the worksheet questions required them to interpret the index in a systematic way that they should always follow. A good way to interpret an index is to read:

   --The title of the index.

   --The source of information used to construct the index.

   --The total time period covered by the index.

   --The headings (name or label) of the vertical and horizontal axes of the index if it is graphed.

--The base year and the value assigned to the base year of the index.

--The units of measure used in the index.

--Any variability (major trends or discrepancies) in the data that may be readily noted.

4. Distribute "Interpreting an Index" (Student Materials #4). Have students read it and then briefly summarize for them:

--Title. A good title should state precisely what the index contains. The title of this index is acceptable because it covers the relative change in violent crime over a time span between 1967 and 1976.

--Source. The source that students used to construct their index fails to tell us who puts out the Statistical Abstract. It is published annually by the Bureau of the Census, Department of Commerce. Knowing the source of information presented in the graph enables us to judge how reliable the data may be.

--Footnotes. Footnotes supply additional information that we may need to know to read the index accurately.

--Headings. The headings of the vertical and horizontal axes provide additional detail on the exact type of information being presented in an index graph. The headings in this index graph inform us that we are dealing with an index number over a period of time (years).

--Units of Measure. An index may be frequently misread because people do not identify the precise type (unit of measure) of data being presented. In this index, the rise in the violent crime rate might not appear as dramatic if measured over a 25 year period instead of a 10 year period.

--Variability. In a sense, the preceding steps are all introductory steps to the main task--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending on the task at hand, the reader will take a more detailed look at the data in order to answer specific questions about it.

Concluding the Lesson

5. Identify for students some of the advantages and disadvantages of presenting information through and index, including:

   --Clarity. An index can present a large amount of information in an orderly, standard format.

   --Economy. An index presents information in a format that economizes on the use of space and words.

   --Information. An index provides a summation of information upon which are based the statements and conclusions found in the text.

   --Understanding. An index may make it easier to compare information and to understand quickly some of the implications of the information.

   --Appeal. An index may appear foreboding or difficult to the uninitiated reader, so they are too often ignored and their usefulness lost.

   - Acceptance. There is a tendency by too many people to accept as unquestionable fact anything presented in numerical or index form, so readers may accept information in an index without critical thought.

6. Suggest that any way of presenting information will have both advantages and disadvantages. If we understand this, we can take a data presentation and attempt to maximize its strengths and minimize its weaknesses when we use it.

SUMMARY OF THE MODULE

This summary may be used to highlight the major points covered in the module.

1. To construct an index we need to know what indicators it will consist of, calculate the total amount of these indicators in a given year, identify a base period, assign a value to the base period, and establish the length of time by which the relative increase or decrease in the index will be measured.

2. There is a systematic sequence a useful way, to read an index: the title, source, footnotes, axes (horizontal and vertical, if it is graphed), headings, units of measure, and variability.

3. The strengths of presenting information through an index include clarity and economy of presenting information in a readily understandable and comparable form.

4. The weaknesses of presenting information through an index include both fear of an index by some people or too ready acceptance of any information presented in numerical or index form.

ADDITIONAL ACTIVITIES

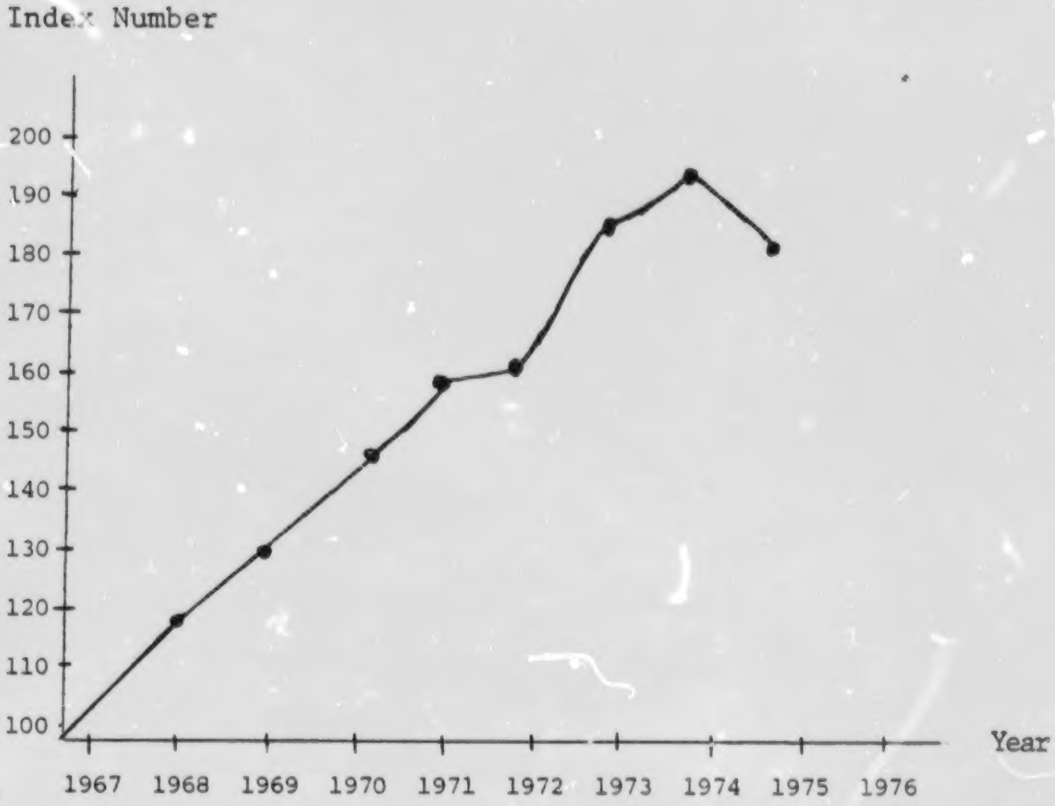
These activities may be used to supplement and extend the basic lessons of the module.

1. Have the students construct additional indexes using data on topics including industrial production, teenage crime, health costs, interest rates, and the price of consumer items.

2. Provide additional indexes from other sources, such as the course text, and have students discuss their strengths and weaknesses.

3. Have students conduct a scavenger hunt for examples of the use of indexes in various sources--texts, newspapers, magazines, and government documents. What topics are covered by the indexes in these sources?

GRAPH OF VIOLENT CRIME INDEX, 1967-76



1967 = 100

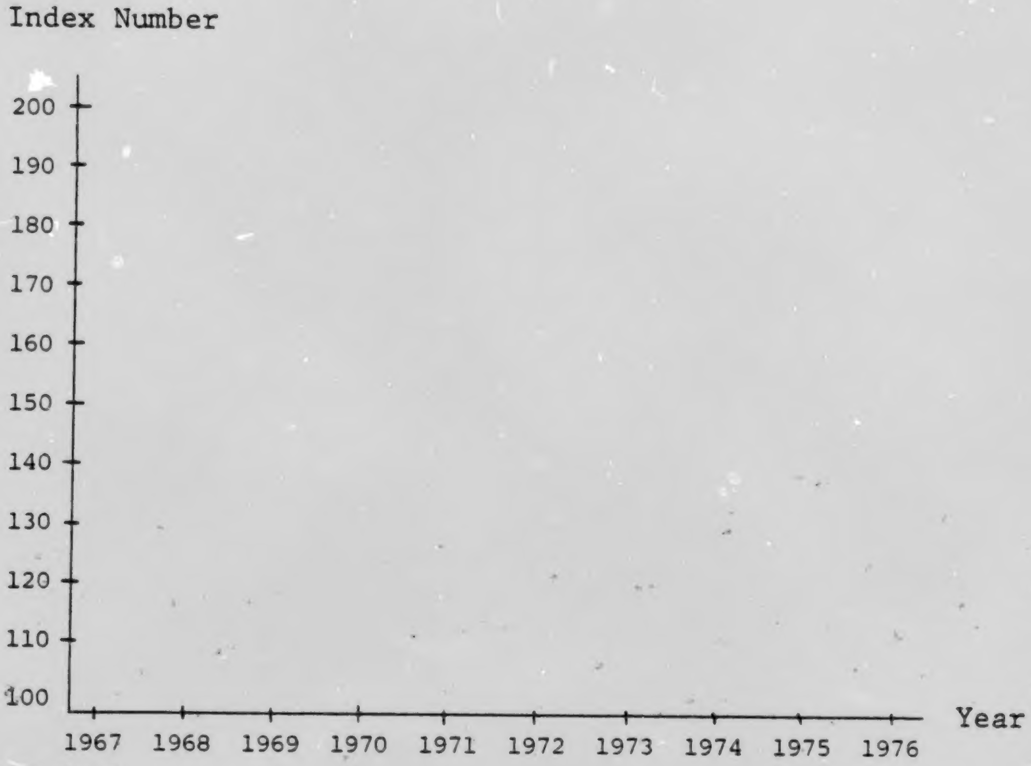
VIOLENT CRIME RATE PER 100,000 POPULATION, 1967-76

Year	Murder	Forcible Rape	Robbery	Aggravated Assault	Total
1967	6.2	14.0	103	130	____
1968	6.9	15.9	132	144	____
1969	7.3	18.5	148	155	____
1970	7.9	18.7	172	165	____
1971	8.6	20.5	188	179	____
1972	9.0	22.5	181	189	____
1973	9.4	24.5	183	201	____
1974	9.8	26.2	209	216	____
1975	9.6	26.3	218	227	____
1976	8.8	26.4	196	229	____

Source: Statistical Abstract of the U.S., 1977.

CONSTRUCTING AN INDEX STUDENT MATERIALS #2

VIOLENT CRIME INDEX GRAPH, 1967-76



1967 = 100

WORKSHEET - VIOLENT CRIME INDEX

Directions: Fill in the blanks with the correct answers, using Student Materials #1 and #2.

1. What could be the title of the index? ____________________

2. Where did the data you used to construct the index come from? ____________________

3. What is the total time period covered by the index? ____________________

4. What is the base year and the value assigned to the base year of the index? ____________________

5. What type of information does the index present? ____________________

6. In which year did the largest proportional increase in the index take place? ____________________

7. In which year did the smallest proportional increase in the index take place? ____________________

8. In which year did the index decrease? ____________________

9. What was the total increase in the index from 1967 to 1976? ____________________

INTERPRETING AN INDEX

A useful way to read and interpret an index is:

--Title. A good title should state precisely what the index contains. The title of this index is acceptable because it covers the relative change in violent crime over a time span between 1967 and 1976.

--Source. The source that students used to construct their index fails to tell us who puts out the Statistical Abstract. It is published annually by the Bureau of the Census, Department of Commerce. Knowing the source of information presented in the graph enables us to judge how reliable the data may be.

--Footnotes. Footnotes supply additional information that we may need to know to read the index accurately.

--Headings. The headings of the vertical and horizontal axes provide additional detail on the exact type of information being presented in the index graph. The headings for this index graph inform us that we are dealing with an index numbers over a period of time (years).

--Units of Measure. An index may be frequently misread because people to not identify the precise type of data being presented. In this index, the rise in the violent crime rate might not appear as dramatic if measured over a 25 year period instead of a 10 year period.

--Variability. In a sense, the preceding steps are all introductory steps to the main tasks--looking at the data being presented. The reader should first glance through the data to note any obvious trends or discrepancies. Secondly, depending on the task at hand, the reader will take a more detailed look at the data in order to answer specific questions about it.

Quesst
Quantitative Understanding to Enhance Social Science Teaching
Educational Resources Center 855 Broadway Boulder, Colorado 80302 303-492-8154

SED-77-18598

ATTACHMENT #13

Publisher-Project Announcement Letter

The Educational Resources Center, affiliated with the Social Science Education Consortium, Inc. of Boulder, Colorado, is completing a two-year project to develop and field test innovative, supplementary classroom curriculum materials for secondary-level social studies courses. The 34 learning activities are designed to teach the very significant, but often neglected, basic in social studies--quantitative concepts. (Enclosed is the Project QUESST list of topics, titles, and concepts.) The activities have been field tested and, on the basis of teacher and student feedback, have been revised in preparation for commercial release. The Educational Resources Center believes these materials will make an important contribution toward demonstrating some new directions for social studies in the coming decade. We would like your help in trying to enhance their impact in secondary schools across the nation. Entitled Quantitative Understanding to Enhance Social Science Teaching, Project QUESST materials were developed with the support of a grant from the National Science Foundation. If your organization is interested in being considered as the publisher and distributor of the project materials, requests for additional details should be directed to Director, Project QUESST, Educational Resources Center, 855 Broadway, Boulder, Colorado 80302, (303) 492-8154. The publisher selected will be expected to participate creatively in decisions regarding materials format and packaging, promotional efforts, and sales. We hope that your organization will be interested in pursuing actively possibilities for being selected as publisher of the Project QUESST materials.

SED-77-18598

ATTACHMENT #14

PUBLISHERS: INITIAL CONTACT

Attachment #14

ABT Associates, Inc.

Addison-Wesley Publishing Company, Inc.

Allyn and Bacon

American Book Company

American Guidance Services, Inc.

American Science and Engineering, Inc.

American Universities Field Staff

Amsco School Publications

Argus Communications

Ateneum Publishers

Avon Books

Bantam Books

Barron's Educational Series

BCA Educational Media

Benetic Press

Benziger Bruce and Glencoe, Inc.

The Bobbs-Merrill Company, Inc.

Stephen Bosustow Productions

Bowman-Noble Publishing Corporation

Broadside Press

Cambridge Book Company

Center for the Humanities, Inc.

Coronet Instruction Media

Changing Times Education Services

Civic Education Services

Thomas Y. Crowell Company, Inc.

Current Affairs

D.C. Heath and Company

Dell Publishing Company, Inc.

Denoyer-Geppert

Doubleday and Company

Educational Design, Inc.

Educational Dimensions Group

Educational Progress Corporation

Fearon-Pitman Publishing Company

Fearon Publishers, Inc.

J.G. Ferguson Publishing Company

Fideler Publishing

Follett Publishing Company

Friendship Press

Garrard Publishing Company

Ginnand Company

Glencoe Publishing Company

Globe Book Company, Inc.

Social Issues Resources Series, Inc.

Goodyear Publishing Company

Greenhaven Press, Inc.

Grosset and Dunlar, Inc.

Harcourt Brace Jovanovich

Harper and Row, Publishers, Inc.

Hat Publishing Company

Hayden Book Company, Inc.

Holt, Rinehart and Winston

Houghton Mifflin Company

Laidlaw Brothers

Learning Ventures

Leswing Communications, Inc.

J.B. Lippincott Company

Little, Brown and Company

Macmillian Publishing Company, Inc.

McDougal, Littell and Company

McGraw-Hill Book Company

Charles E. Merrill Publishing Company

New Dimensions Publishing Company

Newsweek, Inc.

Nobel and Nobel, Publishers, Inc.

Nystrom, Division of Carnatio Company

Oxford University Press

Pathescope Educational Media, Inc.

Pennant Educational Materials

Pergamon Press, Inc.

Praeger Publishing, Inc.

Prentice-Hall, Inc.

QED Productions, Inc.

Rand McNally and Company

Random House, Inc.

William H. Sadlier, Inc.

Scholastic Magazines, Inc.

Science and Mankind

Science Research Associates, Inc.

Scott, Foresman and Company

Simon & Schuster, Inc.

Silver Burdett Company

Messner

Steck-Vaughn

Sunburst Communications

Taylor Publishing Company

Wadsworth Publishing Company, Inc.

Washington Square Press

West Publishing Company, Inc.

Westinghouse Learning Corporation

Winston Press

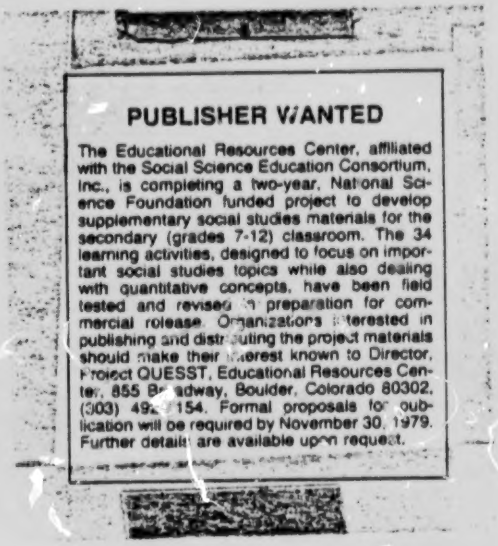
Xerox Educational Publications

SED-77-18598

ATTACHMENT #15

BEST COPY AVAILABLE

Solicitation notice from Publisher's Weekly



PUBLISHER WANTED

The Educational Resources Center, affiliated with the Social Science Education Consortium, Inc., is completing a two-year, National Science Foundation funded project to develop supplementary social studies materials for the secondary (grades 7-12) classroom. The 34 learning activities, designed to focus on important social studies topics while also dealing with quantitative concepts, have been field tested and revised in preparation for commercial release. Organizations interested in publishing and distributing the project materials should make their interest known to Director, Project QUESST, Educational Resources Center, 855 Broadway, Boulder, Colorado 80302, (303) 49[illegible]154. Formal proposals for publication will be required by November 30, 1979. Further details are available upon request.

ATTACHMENT #16

Potential Project Publishers

1. AMSCO School Publications, Inc.
2. Barron's Educational Series, Inc.
3. BFA Educational Media
4. Cambridge Book Company
5. Current Affairs
6. ETC Publications
7. Ginn and Company
8. Hammond, Inc.
9. Key Curriculum Project, University of California at Berkeley
10. McDougal, Littell and Company
11. Pathescope Educational Media, Inc.
12. Teachers College Press, Columbia University
13. Xerox Educational Publications

SED-77-18598

ATTACHMENT #17

PUBLISHER PROPOSALS

ATTACHMENT #17.1

TEACHERS COLLEGE PRESS
TEACHERS COLLEGE COLUMBIA UNIVERSITY
1234 AMSTERDAM AVENUE, NEW YORK, NEW YORK 10027

December 26, 1979

Mr. Kenneth A. Switzer
Staff Associate
QUESST
Educational Resources Center
855 Broadway
Boulder, CO 80302

Dear Mr. Switzer:

I'm very pleased to submit our formal bid for publication of the Project QUESST materials submitted to us in November. I've outlined our capabilities and plans for the series below, and look forward to discussing any or all items with you after you have had a chance to consider our proposal.

Timeline

If we receive complete and acceptable materials by February 1, 1980, we will probably publish the material in January of 1981 in order to obtain a 1981 copyright date.

Format/Packaging

We would publish the materials in the following format: the teacher materials would be combined and published in paperback book form, and the student materials would be printed on spirit masters and sold as shrink-wrapped sets. We feel that this is the optimum format; teachers can use the bound material as a professional/resource book, and the spirit masters will have much greater appeal than bound student materials could possibly have.

Revision Plans

For material of this nature, we feel that issuing revisions every five years is best. This would depend, of course, on ERC's plans and commitments, as well as on the sales history of the product during its first three sales years.

Estimated Sales Price

We estimate that the book of teacher materials will be priced at $14.95 per copy, and that the package of spirit masters will cost $39.95 (for approximately 300 spirit masters).

Estimated Yearly Sales Volume

We estimate a yearly sales volume of 1,500 - 2,000 copies of each component of the product.

Marketing

The following marketing activities would be used to promote and sell the product:

1.) Direct Sales

This product would be intensively marketed through our telephone sales representatives' efforts across the country. They would call on high school social studies chairpersons and teachers to inform them of the product, and would make follow-up calls to potential adopters at appropriate times.

2.) Direct Mail Campaign

Prior to publication, a direct mail piece would be sent to all secondary school social studies department chairpersons and professors teaching methods courses in secondary social studies education at the graduate and undergraduate levels. This piece would solicit orders for the product as well as encourage potential adopters to request complimentary copies for adoption consideration.

3.) Public Relations Activities

Press releases and review copies of the product would be sent to appropriate media personnel to provide the product with maximum exposure to the widest possible audience.

4.) Convention Effort

Teachers College Press normally attends about five national meetings a year. The product would be exhibited at these meetings as well as at a number of local exhibits that we normally attend in the northeastern states. The National Council for the Social Studies convention would be one of the key meetings at which we would exhibit the materials.

5.) Catalogues

The product would be described and highlighted as a new publication in the various catalogues that we produce and distribute, such as our general catalogue, school catalogue, and seasonal catalogue (fall and spring issues).

Previous Publication Experience

As one of the country's oldest university presses (this is our 75th year), Teachers College Press has extensive, solid experience publishing school materials in social studies and all other fields of education. The Teachers College name is known all over the world as a symbol of quality and innovation in the field of education, and in social studies, reading, and early childhood education in particular.

Organizational Stability and Capacity

As a vital part of Teachers College, Columbia University, our financial condition is sound and we are in a position to aggressively produce and market the product.

We have worldwide distribution facilities, as follows:

Orders from United States
Biblio Distribution Center
81 Adams Drive
Totowa, NJ 07512

Orders from Canada
The Guidance Centre, Faculty of Education
University of Toronto
1000 Yonge Street
Toronto, Ontario M4W 2K8
Canada

Orders from U.K., Continental Europe, Israel, and Africa
Eurospan Limited
3 Henrietta Street
London WC2E 8LU
England

Orders from all other countries
Feffer & Simons, Inc.
100 Park Avenue
New York, NY 10027

Our overseas distributors employ marketing personnel who make direct calls to bookstores and college professors in an effort to see that our books and materials are sold and adopted in these territories.

Royalties

We propose to pay a royalty of ten percent of net on all copies of each component sold.

Proposed Role of Grantee

We would expect the grantee to appoint a liaison person or persons who would take on the role of author in terms of contact with the Press's editorial and production staff members. After the project went through our editorial process, we would expect a staff member of the grantee organization to respond to editors' queries and comments, etc. If a revision of the product were undertaken in the future, additional ERC staff members would naturally be expected to undertake the revision, depending on factors cited above under "Revision Plans."

Proposed Exclusive Arrangements

We would copyright the material in the name of the grantee for the allowable term of copyright under the provisions of the NSF grant.

Our worldwide reputation as an outstanding publisher of innovative educational materials for the school, college, professional, and trade markets would enable us to reach the widest possible audience for this product. We hope that you concur with these feelings and that you will place the product with Teachers College Press.

Cordially,

Thomas M. Rotell

Thomas M. Rotell
Director

TMR:jc
enclosure

Quesst
Quantitative Understanding to Enhance Social Science Teaching
Educational Resources Center, 855 Broadway Boulder, Colorado 80302 303-492-8154

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NOV 19 1979

October 23, 1979

Mr. Richard W. Hostrop
ETC Publications
P.O. Drawer 1627-A
Palm Springs, CA 92262

Dear Mr. Hostrop:

Thank you for your recent letter indicating an interest in publishing the Project QUESST materials. As you know, the Educational Resources Center, affiliated with the Social Science Education Consortium, Inc., is completing a two-year project to develop innovative social studies materials for the secondary level social studies curricula. Funded by a National Science Foundation grant, Project QUESST had developed 34 one-day to three-day learning activities. (Enclosed is the Project QUESST list of topics, titles, and concepts. Also enclosed are two sample learning activities developed by Project QUESST.) Each separate activity focuses on an important social studies topic and deals with two or more quantitative concepts. The project materials have been field tested and, based on field test results, revised in preparation for commercial release. Publishers interested in being considered as the publisher/distributor of the Project QUESST curriculum materials should submit a publication proposal to Director, Project QUESST, Educational Resources Center, 855 Broadway, Boulder, Colorado 80302, (303) 492-8154.

The Publication proposal, required under National Science Foundation guidelines, should address the following publisher selection criteria: (A copy of the NSF guidelines is enclosed).

1. Proposed timelines and date of publication of the Project QUESST materials. (The enclosed list of titles and sample learning activities should be used as the basis for estimating publication costs and time requirements.) Within 18 months of receipt of finished materials.
2. Proposed format and method of packaging the Project QUESST materials. For example, paper bound or hard cover; single activity, activity cluster, or total package. Paperbound, either activity cluster or total package, depending upon # of pages.
3. Estimated need for materials revision and update during the estimated published lifetime of the product. Indeterminate at this time...but should be all right for at least three years.
4. Estimated sales price of the published product. Almost impossible to determine without all material but for total about $10 ea
5. Estimated yearly sales volume of the published product. Impossible to determine but ETC would keep in print as long as there was at least 1000 sales per year.

Supported by the National Science Foundation

6. Proposed promotional efforts on behalf of the published product, including estimated budget and proposed activities. About $5,000
Review copies, ads, direct mail, some direct sales calls

7. Previous publication experience with similar or related social studies education materials. Awarded contract for CAREERS AND YOU, A federal grant project done by VPI & SU in Blacksburg, VA

Publishers of THE NATURE OF THE SOCIAL STUDIES by Barr, Barth & Shermis-also TEACHING THE FUTURE by Draper L. Kauffman, Jr.

8. Organizational stability and capacity to produce and disseminate the published product.
Have been in business since 1972. Primaril
educational publishers.

9. Proposed royalty arrangements for the published product.
10% of gross proceeds.

10. Proposed role or involvement of the Project QUESST grantee, the National Science Foundation. Help in making potential users aware of where the materials can be ordered.

11. Proposed exclusive/nonexclusive arrangements for publication of the product.
Exclusive arrangement only considered.

The publication proposal should be submitted in duplicate by December 1, 1979. Final selection of a publisher will be made by the Educational Resources Center, with the approval of the National Science Foundation. Further details will be supplied upon request to the Director, Project QUESST.

Sincerely,

Kenneth A. Switzer
Kenneth A. Switzer
Staff Associate

KAS/ja

Enclosures

Submitted by

Richard W. Hostrop
Richard W. Hostrop, EdD - President
ETC Publications
700 E. Vereda del Sur
Palm Springs, CA 92262

SED-77-18598

ATTACHMENT #18

PUBLICATION AGREEMENT

ATTACHMENT #18

AGREEMENT made this day of 19 by and between EDUCATIONAL RESOURCES CENTER, INC. (hereinafter called the "Author") and TEACHERS COLLEGE PRESS, TEACHERS COLLEGE, COLUMBIA UNIVERSITY, NEW YORK, N.Y. 10027 (hereinafter called the "Publisher").

1. AUTHOR'S GRANT. The Author is the sole proprietor of an unpublished collective work, tentatively entitled PROJECT QUESST (hereinafter called the "Work"). The Author hereby grants and assigns solely and exclusively to the Publisher on the terms herein set forth for the term of copyright the right to print, publish and sell the Work throughout the world in all languages, forms and media, together with all subsidiary rights in and to the Work. The title of the Work may be changed by the Publisher with the consent of the Author.

2. MANUSCRIPT. The Author shall deliver to the Publisher not later than March 1, 1980 two (2) double-spaced typewritten copies of the complete manuscript of the Work in content and form satisfactory to the Publisher and ready to set in type. The manuscript shall include, at the Author's expense, all supplementary materials, including without limitation, photographs, drawings and charts (reproducible without redrawing or relettering) that the Publisher deems necessary. The Author agrees to prepare and supply at its own expense an index to the Work. The index shall be submitted to the Publisher not later that 14 days from the date the Publisher submits page proofs of the Work to the Author. If the Author does not provide photographs, drawings, charts and/or indices that the Publisher deems necessary, such material shall be supplied by the Publisher and charged to the Author at cost. It is understood that the length of the manuscript shall be approximately pages. The Author shall secure at its own expense any necessary permissions to reprint any essential material and shall deliver such permissions in writing to the Publisher with the aforesaid manuscript. Should the Author fail to deliver the materials described hereinabove before the date specified herein, the Publisher may decline to publish the Work and any monies advanced by the Publisher

to the Author hereunder shall be returned by the Author promptly on demand. The provisions as to content and form of the Work are material terms of this agreement and the time of delivery of such manuscript shall be of the essence.

It is understood that the Publisher is not an insurer of or otherwise responsible for manuscripts or drawings or other matter placed in its possession, and no insurance shall be effected by the Publisher for the Author unless at the Author's request and expense. The Author is expected to keep a duplicate manuscript.

3. AGREEMENT TO PUBLISH. The Publisher agrees, upon delivery of a complete and acceptable manuscript, to manufacture, publish and sell the Work at its own expense in style and price as it deems best. The Publisher agrees to publish the Work within eighteen (18) months of delivery of a complete and acceptable manuscript of the Work, but Publisher shall not be responsible for delays caused by strikes, lockout, fire or other circumstances beyond its control.

4. ACKNOWLEDGMENT AND DISCLAIMER. The following statement shall appear on the copyright page of all copies of the Work:

> "This book was prepared with the support of National Science Foundation Grant No. . However, any opinions, findings, conclusions, or recommendations expressed herein are those of the authors and do not necessarily reflect the views of National Science Foundation."

5. COPYRIGHT. The Publisher is expressly authorized as attorney in fact, to take out copyright in the name of the Author in the United States of America and such other countries as may be covered by this agreement, and thereby secure its own rights and those of the Author under the United States Copyright Acts and the Universal Copyright Convention.

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22. HEADINGS. The headings of the paragraphs of this agreement are inserted for convenience only and do not constitute a part of this agreement.

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24. NOTICES. Any notice or communication required or permitted hereunder shall be deemed given when mailed (unless specifically made effective upon receipt) certified or registered mail, return

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IF TO THE PUBLISHER:

Teachers College Press
Teachers College, Columbia University
1234 Amsterdam Avenue
New York, NY 10027
Att.: Director

IF THE THE AUTHOR:

Educational Resources Center, Inc.
855 Broadway
Boulder, CO 80302
Att.: ______________________

IN WITNESS WHEREOF, the parties hereto have duly executed this agreement the day and year first above written.

As to Author:

____
Witness

By: ______________________
Educational Resources Center, Inc.

As to Publisher:

____
Witness

By: Thomas M. Rotell, Director
Teachers College Press, Teachers
College, Columbia University

ATTACHMENT #19

FIELDTEST TEACHER AGREEMENT FORM

ATTACHMENT #19

ID#: ____________________

QUESST
TEACHER BACKGROUND INFORMATION FORM

1. Name: ______________________________ ss# ____________________

2. Home address: ____

3. Home telephone: ____
(area code)

4. Number of credits in statistics: Undergrad: __________
Graduate: __________

5. Number of years of teaching experience __________________

6. School: ____

7. School address: ____

8. School telephone: ____
(area code)

9. District office contact: ______________________________

10. Module cluster used:** ______________________________
____

11. Course title: ____

12. Grade Level: ____

13. Nature of class: ____

14. When will you be teaching with the QUESST modules?
Estimated starting date: ____________________________

Quesst
Quantitative Understanding to Enhance Social Science Teaching
Educational Resources Center 855 Broadway Boulder, Colorado 80302 303-492-8154

QUESST PILOT TEACHER
AGREEMENT FORM

I understand the responsibilities of a QUESST pilot teacher and agree to complete these tasks as part of the QUESST field test program in January-April, 1979.

School ____________________

District __________________

Date ______________________

Pilot Teacher Signatures:

____

____

____

____

____

I understand the basic nature of the QUESST modules and field test program and give my permission for the above teachers to participate in that program.

Date ______________________

Signed ____________________

Position __________________

Supported by the National Science Foundation

Quesst
Quantitative Understanding to Enhance Social Science Teaching
Educational Resources Center 855 Broadway Boulder, Colorado 80302 303-492-8154

QUESST PILOT TEACHER
RESPONSIBILITIES

1. Sign an agreement to participate and obtain written permission from your principal.
2. Attend a one-day orientation prior to the field test.
3. Designate at least one class in which to use the modules and one class as a control group.
4. Administer the pretest to your experimental and control classes.
5. Teach the agreed upon modules sometime during the January to April time period.
6. Allow a QUESST staff member to observe at least one class period where a module is being used.
7. Complete a teacher evaluation from on each module used and have your students fill out a short evaluation form at the end of the field test.
8. Administer the post tests to your experimental and control classes.

Supported by the National Science Foundation

ATTACHMENT #20

Teachers test manual and student pre-tests/posttests for cognitive and affective change.

PROJECT QUESST
Teacher's Test Manual

A set of directions and comments to help
make your testing go more smoothly.

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INTRODUCTION TO THE MANUAL

This manual accompanies the testing materials developed for the Project QUESST module clusters. The manual contains general test-taking guidelines, an introduction to Project QUESST which may be read to students, and specific directions for administering both the Attitude Survey and the Statistical Knowledge Test.

GENERAL TESTING GUIDELINES

The tests which accompany the module clusters are group tests which should be administered to the entire class in a single sitting. The order of instructional events employed in the evaluation of QUESST is shown in Figure 1.

1. Assign QUESST ID numbers to your students. (See QUESST Identification Numbering System).
2. Immediately prior to pretesting, introduce the class to Project QUESST by using the materials provided in page .
3. Administer the pretests. (Note that the pretests should be given before you begin instruction with the QUESST modules, and that the Attitude Survey precedes the Statistical Knowledge Test.
4. Teach the QUESST modules.
5. Administer Posttests.
6. Have the students complete the Student Feedback Forms.
7. Complete the Teacher Feedback Form.

Figure 1. Order of Instructional Events

Standard Testing Conditions

In order to help minimize variations in student performance that might result from different teachers' using different testing procedures, some standard test conditions which you are urged to use are listed here. Generally this means:

1. Copying and cheating should be prohibited.
2. Students should not be allowed to talk to each other during the test.
3. The test should not be given if you suspect the class is highly excited (day before Spring break?) or anxious (report cards?).
4. The testing conditions (room characteristics and time of day) should not inhibit test performance.

Of course there are many other commonsense considerations in administering a test which we felt did not need to be listed here. Beyond these commonsense considerations, however, are a set of frequently encountered problems which sometimes disrupt testing situations.

Common Testing Problems

To gain some consistency in the ways these problems are handled, we have included a list of questions which identify these problems. The answers to the questions provide a way of handling the problems which we hope you will use for us during this study.

Q. What should I do about a student who I think may be cheating?

A. Note your suspicion on the top of the student's answer sheet. You don't have to be certain; strong suspicion is enough for our purposes. Isolate the student if he/she was copying someone else's work. Remove any illicit source of information. Let the student finish the test.

Q. How much aid can I give to a student who doesn't know a word or is confused?

A. You can answer any question as long as your help does not hint at or give the correct answer to the test question. A student with so many questions that he/she disturbs the progress of the testing should probably be tested individually at a later time. (Don't wait too long!!)

Q. Can I go over or discuss the test when we finish?

A. You may do this only after finishing the posttests.

Q. What do I do about a student who missed the pretest?

A. Include the student in class activities without giving him/her a pretest.

Q. Can I give the pretest or posttest if someone is absent?

A. Yes. You may give the pretest or posttest with up to 20% of your class absent. If more than 20% are absent, please do the testing on another day.

Q. What about students with special needs (e.g., visually impaired; hyperactive)?

A. For students with special needs, do what makes sense--just so they get a fair shot at a decent score on the test. (For example you might need to read the test to a visually impaired student.)

Q. What should I do if we can't finish the test once we've started?

A. If you have an unexpected interruption which keeps the class or part of the class from finishing the test, let them finish the test as soon after the interruption as possible.

INTRODUCING PROJECT QUESST TO YOUR CLASS.

Please use the following material in introducing Project QUESST to your class. The introduction should be done before administering the pretest instruments.

> For the next few weeks our class will be taking part in an educational field test of some materials developed by the staff of Project QUESST. The purpose of Project QUESST is to improve students' knowledge of statistical ideas commonly used in the social studies. To find out if you like the materials and how much you learn, Project QUESST staff wants you to complete an Attitude Survey, a Statistical Knowledge Test, and a feedback form designed to collect your comments on the materials. Both the Attitude Survey and The Statistical Knowledge Test are given before you begin using the QUESST materials. When we finish the QUESST materials, you will be taking these same tests again in order to determine how much you've learned.
>
> Although the test of Statistical Knowledge does have correct answers, your grade will not be influenced by your performance on this test or any other testing materials prepared by the QUESST staff.

PROJECT QUESST EVALUATION INSTRUMENT.

The Project QUESST Evaluation Instrument is a teacher administered group test designed to be completed in a single 40 to 45 minute class period. The test will be machine scored, so students should mark their answers with a No. 2 pencil. Students are allowed 10 minutes to complete Part One. Between 25 to 35 minutes should be devoted to Part Two. Students should begin Part Two immediately after finishing Part One. A student should not spend more than 10 minutes on Part One; however, if he/she completes Part Two and has time remaining, that time may be used to complete Part One.

The Evaluation Instrument has two parts. Part One is an attitude survey composed of 27 statements. The student is asked to read each statement and express his or her agreement on a five point Likert scale. Students record their responses to the statements in the first 27 spaces of the machine-scored answer sheet provided by Project QUESST.

Part Two of the Evaluation Instrument is a test of the student's statistical knowledge. It is composed of 25 multiple choice items. These items begin with the number 41 and end with the number 65. Students record their answers to these items on the same machine-scorable answer sheet which was used for the attitude survey (Part One of the Instrument).

STEPS IN ADMINISTERING THE EVALUATION INSTRUMENT.

1. Assign QUESST ID numbers to your students if you have not already done so. See QUESST ID number system. Be sure you keep a record of your students' ID numbers.
2. Read the introduction to Project QUESST (see p. 3).
3. Pass out the machine-scorable answer sheets and have the students fill in their preassigned ID numbers in the Identification Number area of the answer sheet. Note that the first seven digits of the ID number are the same for all students while the last three digits must be assigned individually to each student.
4. Pass out the Evaluation Instrument and go over the directions to both Part One and Part Two.
5. Point out to the students that their responses for Part One are marked in spaces 1 through 27, and that their answers to Part Two are marked in spaces 41 through 65. Check to make sure that students leave numbers 28 through 40 blank.

6. Start the Attitude Survey (Part One) and allow the students ten minutes to complete it.
7. Make sure all students go on to Part Two and that they mark their answers in the correct area.
8. When the students are finished, collect the answer sheets and send them to your local QUESST contact (district social studies consultant).
9. Collect the test booklets and keep them in a safe place for future use on the posttest.

WHAT TO DO IF YOU NEED HELP

For problems related to your work as a Project QUESST Field Test Teacher, you may call (collect) the Project offices. The number is: (303) 492-8154. Ask to speak to Joanne Anglesano, the Project secretary. Describe the nature of your problem or question to Joanne. If she cannot resolve your problem or answer your question, she will refer you to someone who can.

WORLD NATIONS A

QUESST EVALUATION INSTRUMENT FOR PILOT TESTING

Part I: Attitude Survey

The purpose of this questionnaire is to help us to understand how you feel about the use of statistical ideas in social studies. We want your honest answer to each of the statements below. Read each statement and decide if you strongly agree, agree, disagree, strongly disagree, or are undecided. Mark your answer on the standard answer sheet provided. Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

This test will be scored by machine, so mark your answers by darkening in the space over the letter which best describes how you feel. If you change your mind, erase the old answer completely. You may mark only one response for each question. There are no right or wrong answers on this test. Mark the answers which best describe your own attitudes.

YOU HAVE ONLY 10 MINUTES TO COMPLETE THIS PART SO WORK RAPIDLY.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

1. Using statistics is fun.
2. I feel comfortable using statistics.
3. I usually skip over statistics when they appear in a reading.
4. Using statistics makes it difficult to answer social studies questions.
5. I usually hate it when people support their arguments with a lot of statistics.
6. I usually find statistics confusing.
7. America's citizens need more knowledge of how to interpret statistics.
8. Statistics as a school subject is boring.
9. Statistical concepts like mean, median, and percent are important to understanding social studies issues.
10. I often read material which could have been improved by including more statistics.
11. Most social issues and problems can be better understood when we look carefully at accurate statistics.
12. Statistics help me to understand subject matter better.
13. More people should learn how to use statistics.
14. Social studies is less interesting when you use statistical ideas.
15. A knowledge of statistics really doesn't help most people.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

16. Being able to understand statistics is important to learning social studies.

17. Using statistics is really hard for me.

18. I am suspicious of people's arguments if they cannot be supported with statistics.

19. I think it is important to check statistics when they are used in articles or textbooks.

20. Using statistics makes an idea less clear.

21. I often find it helpful to look at statistics when studying social studies.

22. Consumers could do a better job of shopping if they understood some basic statistical ideas.

23. Statistics are not mysterious.

24. Statistical ideas are not very useful in social studies.

25. Social studies as a subject is improved by including statistical ideas.

26. I don't see why we have to use statistics in social studies.

27. Having to use statistics is more trouble than its worth.

Part II. Statistical Knowledge

This is a test of your statistical knowledge. Like the first part of the QUESST Evaluation Instrument, it will also be machine scored.

Note that Part II begins with question number 41. Mark your answer for this question by darkening in the space over the letter which best answers that question. If you change your mind, erase the old answer completely. You may mark only one response for each question. Mark the answer which is most correct. Remeber, Part II of the test begins with question 41.

STATISTICAL KNOWLEDGE TEST

WORLD NATIONS A

Speeds and Weights of Selected Items

Tank (45 m.p.h.) 120,000 lbs.
Racing motorcycle (140 m.p.h.) 800 lbs.
A man walking (5 m.p.h.) 180 lbs.
A crawling worm (1/20 m.p.h.) 2 oz.
Jet fighter (2,300 m.p.h.) 20,000 lbs.
World War II fighter plane (400 m.p.h.) .10,000 lbs.
A thrown football (35 m.p.h.) 1 lb.

41. If the items above were rank ordered by speed which one would be 3rd fastest?

(a) racing motorcycle
(b) a walking man
(c) a football
(d) a jet fighter
(e) World War II fighter plane

42. If the items were rank ordered from heaviest to lightest, which would be the #2 item?

(a) tank
(b) World War II fighter plane
(c) jet fighter
(d) racing motorcycle
(e) a football

43. Which is the most accurate rank order of the following nations from most urban to least urban? Japan = 72% urban, South Korea = 41% urban, China = 23% urban, and Singapore = 100% urban.

(a) Japan
South Korea
China
Singapore

(b) South Korea
Japan
Singapore
China

(c) Singapore
Japan
South Korea
China

(d) China
Singapore
Japan
South Korea

(e) Singapore
Japan
China
South Korea

44. The range of a distribution of numbers is:

(a) the difference between the highest score and lowest score
(b) the size of the average
(c) the number of cases being studied
(d) the percent of cases over the average
(e) the absolute number of cases on either side of the median

45. Which of the following distributions has the largest range?

(a) dress sizes in Mrs. Hoivala's eighth grade class
(b) numbers of goals scored by players on the Toronto Maple Leafs hockey team
(c) annual incomes of people in Atlanta, Georgia
(d) shoe sizes of players on the Dallas Cowboys football team
(e) number of wins among National Football League teams in 1978

46. The range in annual population growth rates for countries of the Middle East is 2.9%. The smallest growth rate of any country in the region is 0.8%. What is the highest growth rate?

(a) 0.8
(b) 3.7
(c) 2.9
(d) 2.1
(e) 2.5

47. Joe Smith is a teacher and has earned salaries of $12,000, $12,750, $13,450, $14,250, and $15,000 in each of the past five years. The range in his salary during that period is:

(a) $12,000
(b) $15,000
(c) $13,450
(d) $3,000
(e) $1,500

48. What is the major weakness of the mean?

(a) it is not a good measure of average
(b) it is unreliable
(c) it is not a real number
(d) it is hard to calculate
(e) it is affected by extreme scores

49. Which measure of average is most influenced by extreme scores?

(a) center
(b) mode
(c) central tendency
(d) median
(e) mean

50. Which measure of average is an arithmetic average?

(a) mode
(b) median
(c) central tendency
(d) range
(e) mean

51. One weakness of an index is that it:

(a) uses two or more measures which are not always of equal importance
(b) does not allow us to make comparisons
(c) can be used only with a small variety of topics
(d) does not allow for the observation of trends and patterns over a given period of time
(c) does not allow us to make estimates about the future

52. Gasoline use goes up with increases in leisure time. This is an example of:

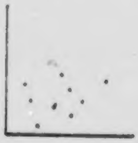
(a) random association
(b) a negative correlation
(c) a range or distribution
(d) a positive correlation
(e) a survey result

53. When average income increases, cases of serious illness tend to decrease. This is an example of:

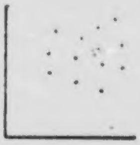
(a) random association
(b) a negative correlation
(c) a range or distribution
(d) a positive correlation
(e) a cause-effect relationship

54. Which of the correlations illustrated on the scatter diagrams below is strongest?

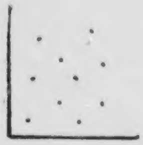
(a)



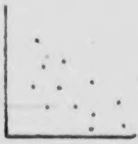
(b)



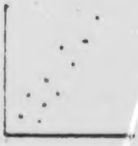
(c)



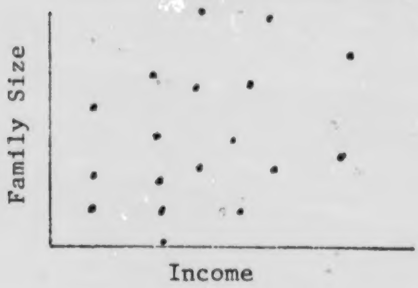
(d)



(e)



Families and Their Income



55. What do the dots represent in the scatter diagram "Families and Their Income"?

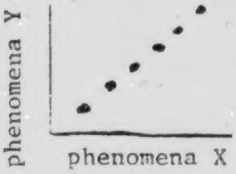
(a) family earning potential

(b) money earned by each family member

(c) specific families

(d) what families should earn

(e) all of the above



56. The scatter diagram above represents:

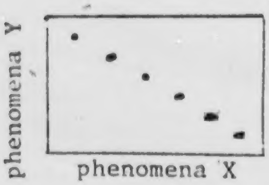
(a) a close positive correlation

(b) a close negative correlation

(c) both a close positive and close negative correlation

(d) neither a close positive or negative correlation

(e) a random distribution



57. The scatter diagram above represents:

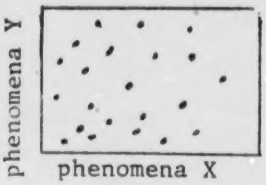
(a) a close positive correlation

(b) a close negative correlation

(c) both a close positive and close negative correlation

(d) neither a close positive or negative correlation

(e) a random distribution



58. The scatter diagram above represents:

(a) a close positive correlation

(b) a close negative correlation

(c) both a close positive and close negative correlation

(d) neither a close positive or negative correlation

(e) no apparent association

Questions 59 through 61 are based on the table below.

Team X		Team Y		Team Z	
Players 1	$100,000	Player 1	$120,000	Player 1	$80,000
Player 2	60,000	Player 2	100,000	Player 2	60,000
Player 3	55,000	Player 3	85,000	Player 3	40,000
Player 4	50,000	Player 4	75,000	Player 4	15,000
Player 5	40,000	Player 5	75,000		
		Player 6	70,000		
TOTAL	$305,000	TOTAL	$525,000	TOTAL	$195,000

59. What is the mean income for Team X?

(a) $61,000
(b) $55,000
(c) $52,500
(d) $80,000
(e) $48,000

60. Which team has the largest range of incomes?

(a) Team X
(b) Team Y
(c) Team Z

61. Which team has the smallest range of incomes?

(a) Team X
(b) Team Y
(c) Team Z

Questions 62 through 65 are based on the table below.

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Vital Statistics, Health, and Nutrition

No. 67. Expectation of Life and Mortality Rates, by Age, Race, and Sex: 1967

AGE (years)	EXPECTATION OF LIFE IN YEARS					MORTALITY RATE PER 1,000 LIVING AT SPECIFIED AGE				
	Total	White		Negro and other		Total	White		Negro and other	
		Male	Female	Male	Female		Male	Female	Male	Female
Under 1	70.5	67.8	[illegible]	61.1	68.2	22.39	22.32	16.82	39.20	32.39
1	71.1	68.3	75.3	62.6	69.5	1.35	1.25	1.05	2.54	2.13
2	70.2	67.4	74.4	61.8	68.6	0.87	0.85	0.70	1.54	1.21
3	69.2	66.5	73.5	60.9	67.7	0.66	0.70	0.51	1.09	0.80
4	68.3	65.5	72.5	59.9	66.8	0.57	0.60	0.45	0.90	0.72
5	67.3	64.6	71.5	59.0	65.8	0.60	0.71	0.42	1.08	0.64
6	66.4	63.6	70.6	58.1	64.9	0.49	0.55	0.37	0.79	0.54
7	65.4	62.7	69.6	57.1	63.9	0.40	0.42	0.33	0.58	0.45
8	64.4	61.7	68.6	56.1	62.9	0.33	0.33	0.29	0.45	0.39
9	63.4	60.7	67.6	55.2	62.0	0.29	0.28	0.25	0.39	0.36
10	62.4	59.7	66.7	54.2	61.0	0.28	0.28	0.24	0.40	0.34
11	61.5	58.7	65.7	53.2	60.0	0.30	0.33	0.24	0.48	0.35
12	60.5	57.8	64.7	52.2	59.0	0.37	0.44	0.26	0.61	0.39
13	59.5	56.8	63.7	51.3	58.0	0.47	0.60	0.30	0.79	0.44
14	58.5	55.8	62.7	50.3	57.1	0.61	0.80	0.37	1.02	0.51
15	57.6	54.9	61.7	49.4	56.1	0.77	1.03	0.44	1.29	0.60
16	56.6	53.9	60.8	48.4	55.1	0.93	1.26	0.52	1.58	0.70
17	55.7	53.0	59.8	47.5	54.2	1.06	1.45	0.57	1.88	0.80
18	54.7	52.1	58.8	46.6	53.2	1.15	1.59	0.60	2.18	0.90
19	53.8	51.1	57.9	45.7	52.3	1.21	1.68	0.61	2.48	1.00
20	52.9	50.2	56.9	44.8	51.3	1.27	1.77	0.61	2.80	1.12
21	51.9	49.3	55.9	43.9	50.4	1.33	1.85	0.62	3.11	1.24
22	51.0	48.4	55.0	43.1	49.4	1.37	1.88	0.63	3.38	1.35
23	50.1	47.5	54.0	42.2	48.5	1.37	1.86	0.64	3.58	1.45
24	49.1	46.6	53.0	41.4	47.6	1.36	1.79	0.65	3.73	1.53
25	48.2	45.7	52.1	40.5	46.6	1.35	1.70	0.65	3.87	1.61
26	47.3	44.7	51.1	39.7	45.7	1.34	1.62	0.67	4.02	1.71
27	46.3	43.8	50.1	38.8	44.8	1.34	1.57	0.69	4.19	1.85
28	45.4	42.9	49.2	38.0	43.9	1.38	1.56	0.72	4.39	2.05
29	44.4	41.9	48.2	37.1	43.0	1.44	1.59	0.76	4.62	2.28
30	43.5	41.0	47.2	36.3	42.1	1.50	1.63	0.81	4.87	2.54
31	42.6	40.1	46.3	35.5	41.2	1.58	1.68	0.86	5.13	2.80
32	41.6	39.1	45.3	34.7	40.3	1.68	1.76	0.93	5.40	3.06
33	40.7	38.2	44.4	33.9	39.4	1.79	1.87	1.02	5.67	3.31
34	39.8	37.3	43.4	33.0	38.5	1.93	2.02	1.12	5.95	3.55
35	38.9	36.4	42.5	32.2	37.7	2.09	2.20	1.24	6.25	3.80
36	37.9	35.4	41.5	31.4	36.8	2.27	2.40	1.36	6.58	4.08
37	37.0	34.5	40.6	30.6	36.0	2.45	2.62	1.49	6.98	4.35
38	36.1	33.6	39.6	29.9	35.1	2.65	2.85	1.63	7.47	4.62
39	35.2	32.7	38.7	29.1	34.3	2.86	3.09	1.77	8.04	4.90
40	34.3	31.8	37.8	28.3	33.4	3.10	3.37	1.93	8.68	5.19
41	33.4	30.9	36.8	27.6	32.6	3.36	3.69	2.11	9.33	5.50
42	32.5	30.0	35.9	26.8	31.8	3.66	4.06	2.31	9.96	5.87
43	31.6	29.1	35.0	26.1	31.0	4.00	4.49	2.54	10.53	6.29
44	30.8	28.3	34.1	25.3	30.2	4.37	4.98	2.79	11.07	6.77
45	29.9	27.4	33.2	24.6	29.4	4.78	5.52	3.07	11.62	7.29
46	29.0	26.6	32.3	23.9	28.6	5.23	6.12	3.37	12.26	7.84
47	28.2	25.7	31.4	23.2	27.8	5.72	6.77	3.67	13.04	8.41
48	27.3	24.9	30.5	22.5	27.0	6.26	7.50	3.99	14.02	8.99
49	26.5	24.1	29.6	21.8	26.3	6.84	8.29	4.32	15.16	9.60
50	25.7	23.3	28.7	21.1	25.5	7.47	9.14	4.67	16.38	10.25
51	24.9	22.5	27.9	20.5	24.8	8.14	10.07	5.05	17.64	10.96
52	24.1	21.7	27.0	19.8	24.0	8.89	11.09	5.47	19.00	11.76
53	23.3	20.9	26.2	19.2	23.3	9.71	12.23	5.93	20.46	12.67
54	22.5	20.2	25.3	18.6	22.6	10.59	13.49	6.42	22.00	13.69
55	21.8	19.5	24.5	18.0	21.9	11.56	14.82	6.98	23.74	14.84
56	21.0	18.8	23.6	17.4	21.2	12.58	16.21	7.58	25.56	16.07
57	20.3	18.1	22.8	16.9	20.6	13.65	17.76	8.20	27.20	17.27
58	19.5	17.4	22.0	16.3	19.9	14.75	19.38	8.82	28.51	18.40
59	18.8	16.7	21.2	15.8	19.3	15.90	21.11	9.48	29.64	19.53
60	18.1	16.1	20.4	15.3	18.7	17.12	22.96	10.19	30.54	20.52
61	17.4	15.4	19.6	14.7	18.1	18.44	24.93	11.01	31.69	21.69
62	16.7	14.8	18.8	14.2	17.5	19.94	26.98	12.00	33.74	23.60
63	16.1	14.2	18.0	13.7	16.9	21.66	29.10	13.21	37.13	26.56
64	15.4	13.6	17.3	13.2	16.3	23.58	31.32	14.62	41.64	30.33
65	14.8	13.0	16.5	12.7	15.8	25.62	33.61	16.17	46.85	34.69
66	14.2	12.5	15.8	12.3	15.4	27.79	36.07	17.84	52.10	38.95
67	13.6	11.9	15.1	12.0	15.0	30.16	38.93	19.71	57.06	42.40
68	13.0	11.4	14.3	11.7	14.6	32.76	42.34	21.81	61.22	44.39
69	12.4	10.9	13.7	11.4	14.3	35.59	46.24	24.13	64.63	45.13

Source: Dept. of Health, Education, and Welfare, Public Health Service; annual report, *Vital Statistics of the United States.*

62. If you were a black male aged 21 in 1967, how many years could you expect to live?

(a) 51.9

(b) 43.9

(c) 49.3

(d) 50.2

(e) 55.9

63. How many white males aged 67 die per 1000?

(a) 30.16

(b) 38.93

(c) 19.71

(d) 52.10

(e) 57.06

64. How many black females aged 67 die per 1000?

(a) 15.1

(b) 12.0

(c) 30.6

(d) 19.71

(e) 42.40

65. If you were a white female and had a life expectancy of 28.7 years in 1967, how old were you?

(a) 23.3

(b) 28.7

(c) 50.0

(d) 39.0

(e) 44.0

WORLD NATIONS B

QUESST EVALUATION INSTRUMENT FOR PILOT TESTING

Part I: Attitude Survey

The purpose of this questionnaire is to help us to understand how you feel about the use of statistical ideas in social studies. We want your honest answer to each of the statements below. Read each statement and decide if you strongly agree, agree, disagree, strongly disagree, or are undecided. Mark your answer on the standard answer sheet provided. Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

This test will be scored by machine, so mark your answers by darkening in the space over the letter which best describes how you feel. If you change your mind, erase the old answer completely. You may mark only one response for each question. There are no right or wrong answers on this test. Mark the answers which best describe your own attitudes.

YOU HAVE ONLY 10 MINUTES TO COMPLETE THIS PART SO WORK RAPIDLY.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

1. Using statistics is fun.
2. I feel comfortable using statistics.
3. I usually skip over statistics when they appear in a reading.
4. Using statistics makes it difficult to answer social studies questions.
5. I usually hate it when people support their arguments with a lot of statistics.
6. I usually find statistics confusing.
7. America's citizens need more knowledge of how to interpret statistics.
8. Statistics as a school subject is boring.
9. Statistical concepts like mean, median, and percent are important to understanding social studies issues.
10. I often read material which could have been improved by including more statistics.
11. Most social issues and problems can be better understood when we look carefully at accurate statistics.
12. Statistics help me to understand subject matter better.
13. More people should learn how to use statistics.
14. Social studies is less interesting when you use statistical ideas.
15. A knowledge of statistics really doesn't help most people.

Use this key when marking your answers.

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

16. Being able to understand statistics is important to learning social studies.

17. Using statistics is really hard for me.

18. I am suspicious of people's arguments if they cannot be supported with statistics.

19. I think it is important to check statistics when they are used in articles or textbooks.

20. Using statistics makes an idea less clear.

21. I often find it helpful to look at statistics when studying social studies.

22. Consumers could do a better job of shopping if they understood some basic statistical ideas.

23. Statistics are not mysterious.

24. Statistical ideas are not very useful in social studies.

25. Social studies as a subject is improved by including statistical ideas.

26. I don't see why we have to use statistics in social studies.

27. Having to use statistics is more trouble than its worth.

Part II. Statistical Knowledge

This is a test of your statistical knowledge. Like the first part of the QUESST Evaluation Instrument, it will also be machine scored.

Note that Part II begins with question number 41. Mark your answer for this question by darkening in the space over the letter which best answers that question. If you change your mind, erase the old answer completely. You may mark only one response for each question. Mark the answer which is most correct. Remeber, Part II of the test begins with question 41.

STATISTICAL KNOWLEDGE TEST

WORLD NATIONS B

41. The population of an eastern city fell from 2,000 to 1,700 over the last 3 years. What was the percentage of decrease in the population?

    (a) 20%
    (b) 15%
    (c) 10%
    (d) 25%
    (e) 50%

42. Percentages are useful when looking at change because they tell us?

    (a) real numbers
    (b) abstract numbers
    (c) absolute change
    (d) raw numbers
    (e) proportions

DOLLARS SPENT ON MUNICIPAL SERVICES

	1950	1975
Police & Fire	$1,000	$1,500
Roads	1,000	1,600
Schools	4,010	6,000
Water	500	1,500
Insurance	100	200

43. In the table above, which of the services had the largest percentage increase in spending?

(a) police & fire
(b) schools
(c) road maintenance
(d) water treatment
(e) insurance

44. Gasoline use goes up with increases in leisure time. This is an example of:

(a) random association
(b) a negative correlation
(c) a range or distribution
(d) a positive correlation
(e) a survey result

45. When average income increases, cases of serious illness tend to decrease. This is an example of:

(a) random association
(b) a negative correlation
(c) a range or distribution
(d) a positive correlation
(e) a cause-effect relationship

46. The median population size of the following cities is? City A--5,000; City B--6,275; City C--2,600,500; City D--19,680; City E--99,300.

(a) 99,300
(b) 6,275
(c) 18,200
(d) 19,680
(e) 546,151

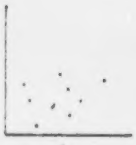
47. Which measure of average is best to use when the data has extremely high or low scores?

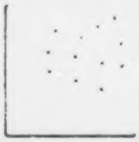
(a) mean
(b) center
(c) median
(d) central tendency
(e) mode

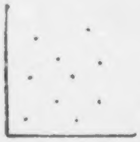
48. Which measure of average is a point above which are half of the scores and below which are the other half of the scores?

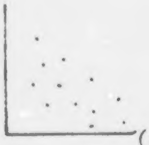
(a) mean
(b) median
(c) mode
(d) range
(e) central tendency

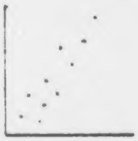
49. Which of the correlations illustrated on the scatter diagrams below is strongest?

(a)


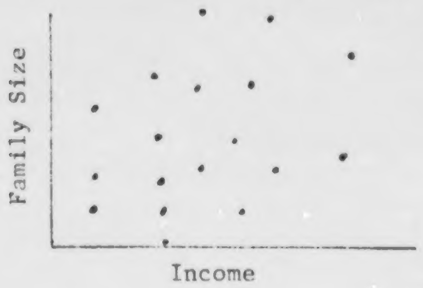
(b)


(c)


(d)


(e)


Families and Their Income



50. What do the dots represent in the scatter diagram "Families and Their Income"?

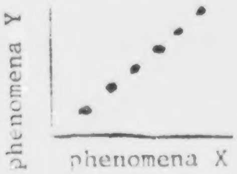
(a) family earning potential

(b) money earned by each family member

(c) specific families

(d) what families should earn

(e) all of the above



51. The scatter diagram above represents:

(a) a close positive correlation

(b) a close negative correlation

(c) both a close positive and close negative correlation

(d) neither a close positive or negative correlation

(e) a random distribution

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Questions 51 through 54 are based on the table below.

Vital Statistics, Health, and Nutrition

No. 67. Expectation of Life and Mortality Rates, by Age, Race, and Sex: 1967

Age (years)	Expectation of life in years: Total	White: Male	White: Female	Negro and other: Male	Negro and other: Female	Mortality rate per 1,000 living at specified age: Total	White: Male	White: Female	Negro and other: Male	Negro and other: Female
Under 1	70.5	67.8	75.1	61.1	68.2	22.39	22.32	16.82	39.20	32.39
1	71.1	68.3	75.3	62.6	69.5	1.35	1.25	1.05	2.54	2.13
2	70.2	67.4	74.4	61.8	68.6	0.87	0.85	0.70	1.54	1.21
3	69.2	66.5	73.5	60.9	67.7	0.66	0.70	0.51	1.09	0.80
4	68.3	65.5	72.5	59.9	66.8	0.57	0.60	0.45	0.90	0.72
5	67.3	64.6	71.5	59.0	65.8	0.60	0.71	0.42	1.08	0.64
6	66.4	63.6	70.6	58.1	64.9	0.49	0.55	0.37	0.79	0.54
7	65.4	62.7	69.6	57.1	63.9	0.40	0.42	0.33	0.58	0.45
8	64.4	61.7	68.6	56.1	62.9	0.33	0.33	0.29	0.45	0.39
9	63.4	60.7	67.6	55.2	62.0	0.29	0.28	0.25	0.39	0.36
10	62.4	59.7	66.7	54.2	61.0	0.28	0.28	0.24	0.40	0.34
11	61.5	58.7	65.7	53.2	60.0	0.30	0.33	0.24	0.48	0.35
12	60.5	57.8	64.7	52.2	59.0	0.37	0.44	0.26	0.61	0.39
13	59.5	56.8	63.7	51.3	58.0	0.47	0.60	0.30	0.79	0.44
14	58.5	55.8	62.7	50.3	57.1	0.61	0.80	0.37	1.02	0.51
15	57.6	54.9	61.7	49.4	56.1	0.77	1.03	0.44	1.29	0.60
16	56.6	53.9	60.8	48.4	55.1	0.93	1.26	0.52	1.58	0.70
17	55.7	53.0	59.8	47.5	54.2	1.06	1.45	0.57	1.88	0.80
18	54.7	52.1	58.8	46.6	53.2	1.15	1.59	0.60	2.18	0.90
19	53.8	51.1	57.9	45.7	52.3	1.21	1.68	0.61	2.48	1.00
20	52.9	50.2	56.9	44.8	51.3	1.27	1.77	0.61	2.80	1.12
21	51.9	49.3	55.9	43.9	50.4	1.33	1.85	0.62	3.11	1.24
22	51.6	48.4	55.0	43.1	49.4	1.37	1.88	0.63	3.38	1.35
23	50.1	47.5	54.0	42.2	48.5	1.37	1.86	0.64	3.58	1.45
24	49.1	46.6	53.0	41.4	47.6	1.36	1.79	0.65	3.73	1.53
25	48.2	45.7	52.1	40.5	46.6	1.35	1.70	0.65	3.87	1.61
26	47.3	44.7	51.1	39.7	45.7	1.34	1.62	0.67	4.02	1.71
27	46.3	43.8	50.1	38.8	44.8	1.34	1.57	0.69	4.19	1.85
28	45.4	42.9	49.2	38.0	43.9	1.38	1.56	0.72	4.39	2.05
29	44.4	41.9	48.2	37.1	43.0	1.44	1.59	0.76	4.62	2.28
30	43.5	41.0	47.2	36.3	42.1	1.50	1.63	0.81	4.87	2.54
31	42.6	40.1	46.3	35.5	41.2	1.58	1.68	0.86	5.13	2.80
32	41.6	39.1	45.3	34.7	40.3	1.68	1.76	0.93	5.40	3.06
33	40.7	38.2	44.4	33.9	39.4	1.79	1.87	1.02	5.67	3.31
34	39.8	37.3	43.4	33.0	38.5	1.93	2.02	1.12	5.95	3.55
35	38.9	36.4	42.5	32.2	37.7	2.09	2.20	1.24	6.25	3.80
36	37.9	35.4	41.5	31.4	36.8	2.27	2.40	1.36	6.58	4.08
37	37.0	34.5	40.6	30.6	36.0	2.45	2.62	1.49	6.98	4.35
38	36.1	33.6	39.6	29.9	35.1	2.65	2.85	1.63	7.47	4.62
39	35.2	32.7	38.7	29.1	34.3	2.86	3.09	1.77	8.04	4.90
40	34.3	31.8	37.8	28.3	33.4	3.10	3.37	1.93	8.68	5.19
41	33.4	30.9	36.8	27.6	32.6	3.36	3.69	2.11	9.33	5.50
42	32.5	30.0	35.9	26.8	31.8	3.66	4.06	2.31	9.96	5.87
43	31.6	29.1	35.0	26.1	31.0	4.00	4.49	2.54	10.53	6.29
44	30.8	28.3	34.1	25.3	30.2	4.37	4.98	2.79	11.07	6.77
45	29.9	27.4	33.2	24.6	29.4	4.78	5.52	3.07	11.62	7.29
46	29.0	26.6	32.3	23.9	28.6	5.23	6.12	3.37	12.26	7.84
47	28.2	25.7	31.4	23.2	27.8	5.72	6.77	3.67	13.04	8.41
48	27.3	24.9	30.5	22.5	27.0	6.26	7.50	3.99	14.02	8.99
49	26.5	24.1	29.6	21.8	26.3	6.84	8.29	4.32	15.16	9.60
50	25.7	23.3	28.7	21.1	25.5	7.47	9.14	4.67	16.38	10.25
51	24.9	22.5	27.9	20.5	24.8	8.14	10.07	5.05	17.64	10.96
52	24.1	21.7	27.0	19.8	24.0	8.89	11.09	5.47	19.00	11.73
53	23.3	20.9	26.2	19.2	23.3	9.71	12.23	5.93	20.46	12.67
54	22.5	20.2	25.3	18.6	22.6	10.59	13.49	6.42	22.00	13.69
55	21.8	19.5	24.5	18.0	21.9	11.56	14.82	6.98	23.74	14.84
56	21.0	18.8	23.6	17.4	21.2	12.58	16.24	7.58	25.56	16.07
57	20.3	18.1	22.8	16.9	20.6	13.65	17.76	8.20	27.20	17.27
58	19.5	17.4	22.0	16.3	19.9	14.75	19.38	8.82	28.51	18.40
59	18.8	16.7	21.2	15.8	19.3	15.90	21.11	9.48	29.64	19.53
60	18.1	16.1	20.4	15.3	18.7	17.12	22.96	10.19	33.54	20.52
61	17.4	15.4	19.6	14.7	18.1	18.44	24.97	11.01	31.69	21.69
62	16.7	14.8	18.8	14.2	17.5	19.94	26.98	12.00	33.74	23.00
63	16.1	14.2	18.0	13.7	16.9	21.66	29.10	13.21	37.13	25.56
64	15.4	13.6	17.3	13.2	16.3	23.58	31.32	14.62	41.64	30.33
65	14.8	13.0	16.5	12.7	15.8	25.62	33.61	16.17	46.85	34.69
66	14.2	12.5	15.8	12.3	15.4	27.79	36.07	17.84	52.10	38.95
67	13.5	11.9	15.1	12.0	15.0	30.16	38.93	19.71	57.06	42.40
68	13.0	11.4	14.3	11.7	14.6	32.76	42.34	21.81	61.22	44.39
69	12.4	10.9	13.7	11.4	14.3	35.59	46.24	24.13	64.63	45.13

Source: Dept. of Health, Education, and Welfare, Public Health Service, annual report, *Vital Statistics of the United States.*

52. If you were a black male aged 21 in 1967, how many years could you expect to live?

(a) 51.9
(b) 43.9
(c) 49.3
(d) 50.2
(e) 55.9

53. How many white males aged 67 die per 1000?

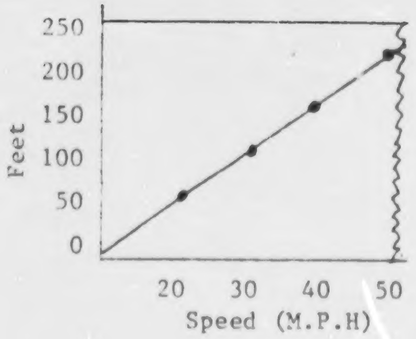
(a) 30.16
(b) 38.93
(c) 19.71
(d) 52.10
(e) 57.06

54. How many black females aged 67 die per 1000?

(a) 15.1
(b) 12.0
(c) 30.6
(d) 19.71
(e) 42.40

55. If you were a white female and had a life expectancy of 28.7 years in 1967, how old were you?

(a) 23.3
(b) 28.7
(c) 50.0
(d) 39.0
(e) 44.0


Distance Required To Stop An Automobile

56. What seems to be the most reasonable estimate for the distance required to stop at 55 m.p.h.?

    (a) 200 feet

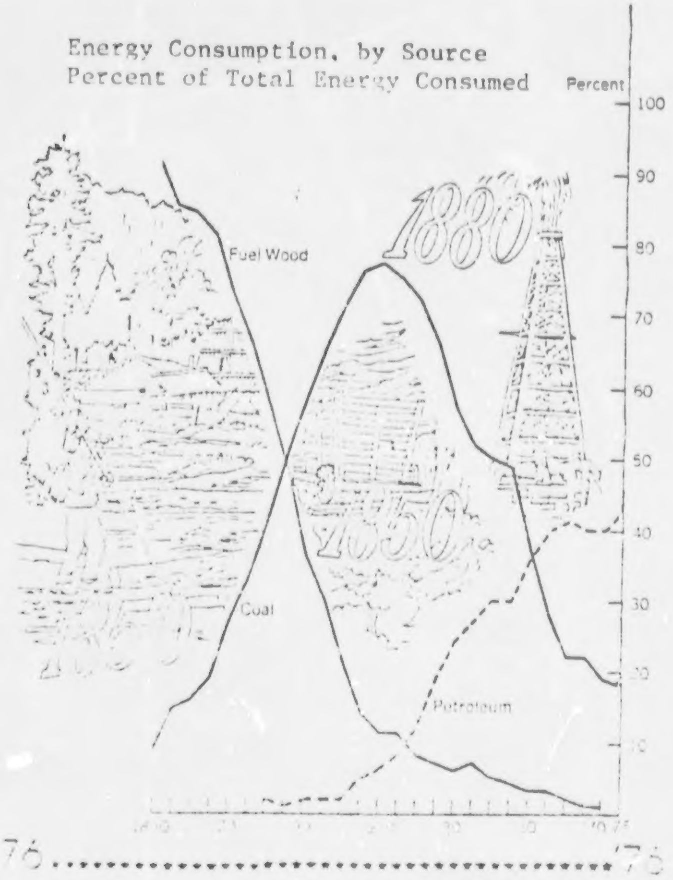
    (b) 240 feet

    (c) 300 feet

    (d) 220 feet

    (e) 380 feet

Questions 57 through 60 refer to the graph below.


Energy Consumption, by Source
Percent of Total Energy Consumed

57. At its peak, coal comprised what percent of total energy consumed?

(a) 19%

(b) 50%

(c) 8%

(d) 78%

(e) 95%

58. In what year did coal and fuel wood each comprise approximately 50% of the energy consumed in the U.S.?

(a) 1850

(b) 1885

(c) 1917

(d) 1950

(e) 1970

59. The point of intersection of two lines on this graph means:

(a) that those two energy sources both comprised half of the total energy consumed in the U.S.

(b) that each of those two energy sources have reached their peak in terms of the percent of total energy consumed

(c) that each of those two energy sources comprised the same percent of total energy consumed in the U.S. that year

(d) the total amount of coal and fuel wood consumed that year was the same

(e) that America dramatically changed its consumption practices that year

60. This graph indicates that:

(a) twice as much petroleum was being used as coal in 1975

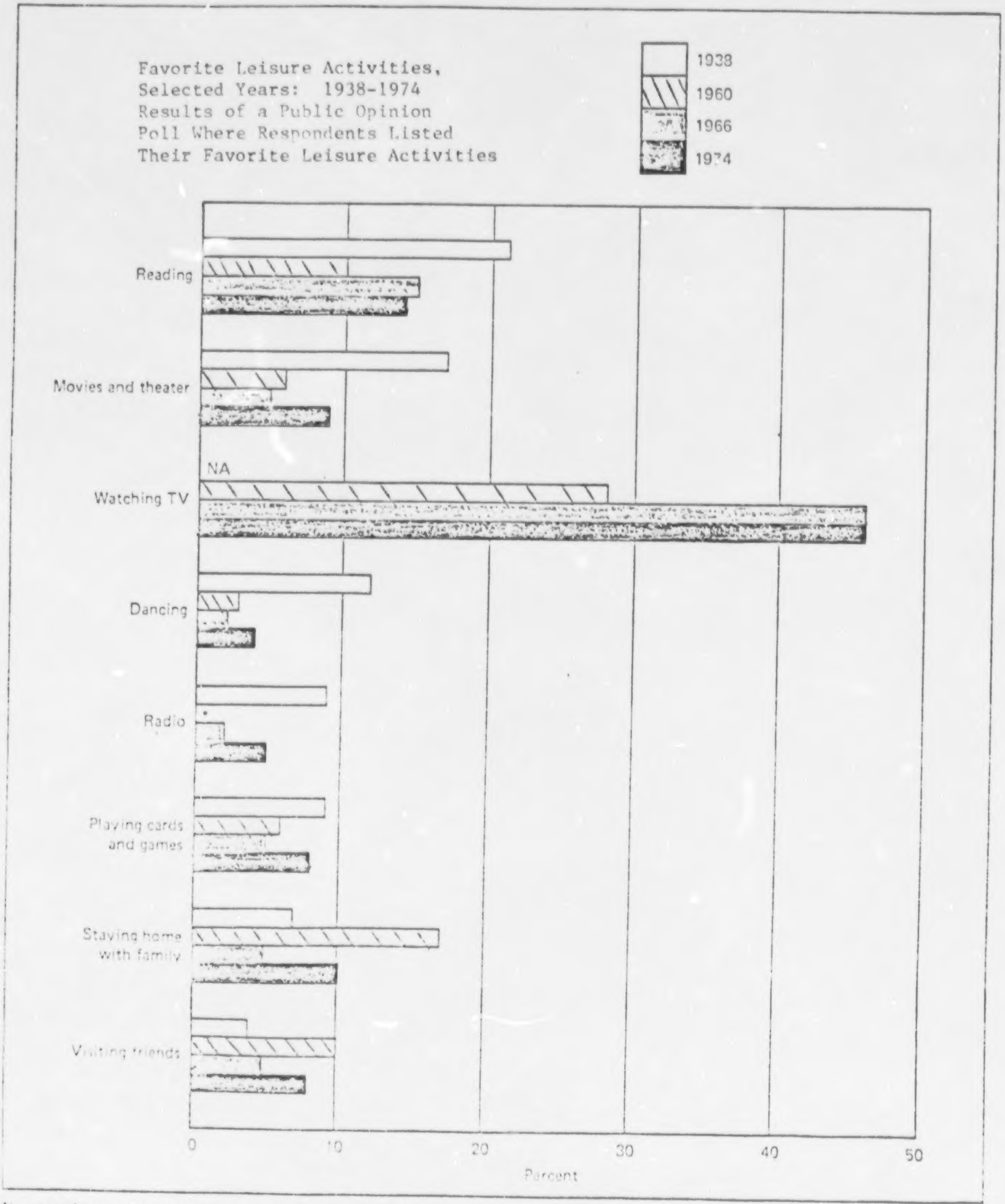
(b) petroleum has not always been a major source of energy in the U.S.

(c) less coal was burned in 1945 than in 1930

(d) the proportion of total energy consumed by fuel wood has generally declined since 1850

(e) all of these

Questions 61 through 65 refer to the graph below.



Favorite Leisure Activities,
Selected Years: 1938-1974
Results of a Public Opinion
Poll Where Respondents Listed
Their Favorite Leisure Activities

*Less than 1 percent. NA Not available. See technical notes and table 10.4.

Source: The Gallup Opinion Index, report No. 5, March 1974, Copyright by the American Institute of Public Opinion. Graph published in Social Indicator 1976, Bureau of Census, p. 492.

61. According to this graph, which leisure activity is by far the most popular among Americans?

(a) reading

(b) movies and theater

(c) watching TV

(d) dancing

(e) radio

62. What percent of the people surveyed in 1938 rated reading a favorite leisure activity?

(a) 43%

(b) 21%

(c) 10%

(d) 18%

(e) 52%

63. In what year did "movies and theater" receive their lowest rating?

(a) 1938

(b) 1960

(c) 1966

(d) 1974

64. Excluding "Watching TV", what activity received the highest rating from Americans in 1960?

(a) reading

(b) movies and theater

(c) dancing

(d) radio

(e) staying home with family

65. Which of the following activities received a higher rating in 1960 than in 1938?

(a) reading

(b) movies and theater

(c) playing cards

(d) dancing

(e) visiting friends

U.S. POPULATION TRENDS

QUESST EVALUATION INSTRUMENT
FOR PILOT TESTING

Part I: Attitude Survey

The purpose of this questionnaire is to help us to understand how you feel about the use of statistical ideas in social studies. We want your honest answer to each of the statements below. Read each statement and decide if you strongly agree, agree, disagree, strongly disagree, or are undecided. Mark your answer on the standard answer sheet provided. Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

This test will be scored by machine, so mark your answers by darkening in the space over the letter which best describes how you feel. If you change your mind, erase the old answer completely. You may mark only one response for each question. There are no right or wrong answers on this test. Mark the answers which best describe your own attitudes.

YOU HAVE ONLY 10 MINUTES TO COMPLETE THIS PART SO WORK RAPIDLY.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

1. Using statistics is fun.
2. I feel comfortable using statistics.
3. I usually skip over statistics when they appear in a reading.
4. Using statistics makes it difficult to answer social studies questions.
5. I usually hate it when people support their arguments with a lot of statistics.
6. I usually find statistics confusing.
7. America's citizens need more knowledge of how to interpret statistics.
8. Statistics as a school subject is boring.
9. Statistical concepts like mean, median, and percent are important to understanding social studies issues.
10. I often read material which could have been improved by including more statistics.
11. Most social issues and problems can be better understood when we look carefully at accurate statistics.
12. Statistics help me to understand subject matter better.
13. More people should learn how to use statistics.
14. Social studies is less interesting when you use statistical ideas.
15. A knowledge of statistics really doesn't help most people.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

16. Being able to understand statistics is important to learning social studies.

17. Using statistics is really hard for me.

18. I am suspicious of people's arguments if they cannot be supported with statistics.

19. I think it is important to check statistics when they are used in articles or textbooks.

20. Using statistics makes an idea less clear.

21. I often find it helpful to look at statistics when studying social studies.

22. Consumers could do a better job of shopping if they understood some basic statistical ideas.

23. Statistics are not mysterious.

24. Statistical ideas are not very useful in social studies.

25. Social studies as a subject is improved by including statistical ideas.

26. I don't see why we have to use statistics in social studies.

27. Having to use statistics is more trouble than its worth.

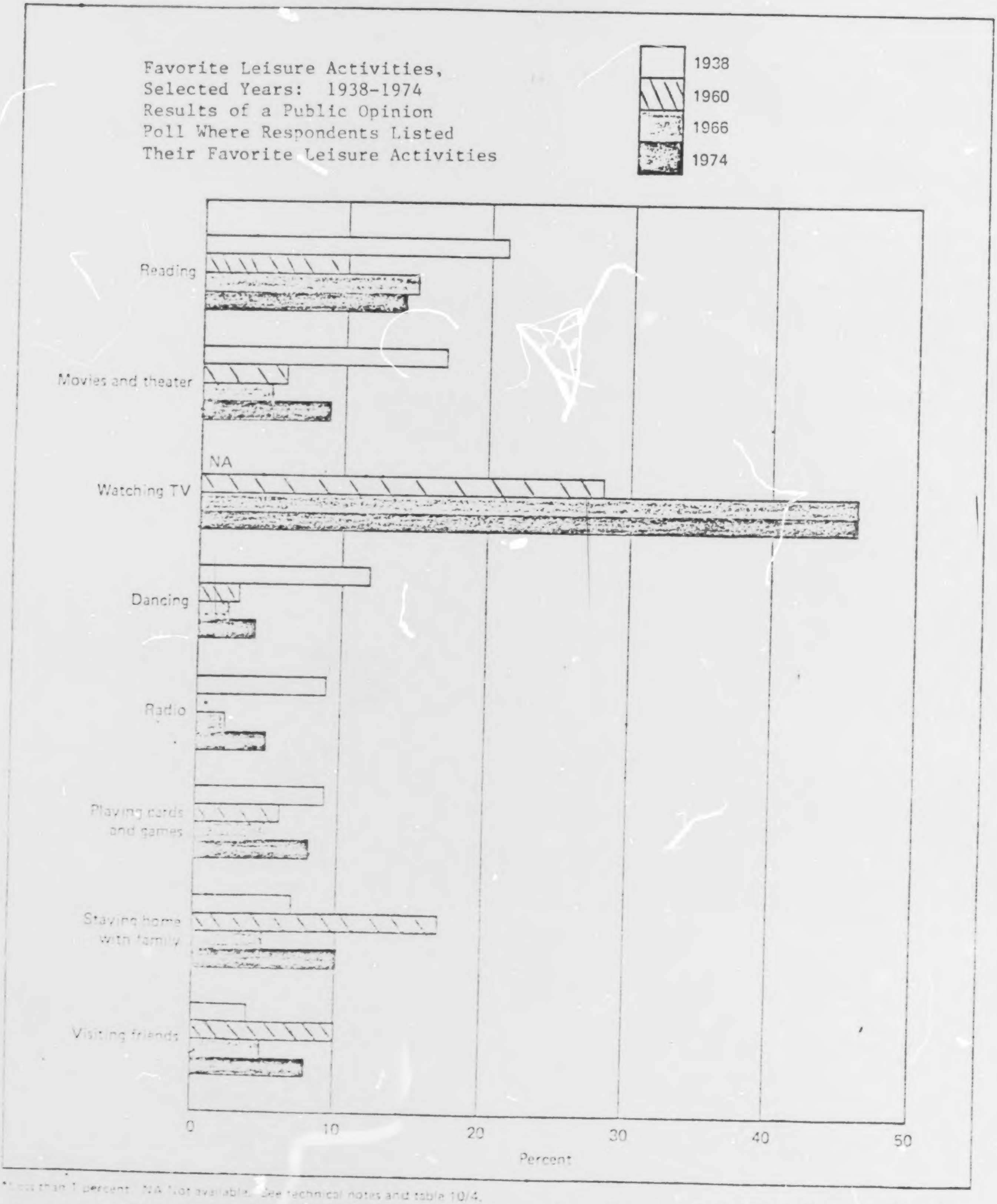
Part II. Statistical Knowledge

This is a test of your statistical knowledge. Like the first part of the QUESST Evaluation Instrument, it will also be machine scored.

Note that Part II begins with question number 41. Mark your answer for this question by darkening in the space over the letter which best answers that question. If you change your mind, erase the old answer completely. You may mark only one response for each question. Mark the answer which is most correct. Remeber, Part II of the test begins with question 41.

STATISTICAL KNOWLEDGE TEST

Questions 41 through 45 refer to the graph below.



Favorite Leisure Activities,
Selected Years: 1938-1974
Results of a Public Opinion
Poll Where Respondents Listed
Their Favorite Leisure Activities

*Less than 1 percent. NA Not available. See technical notes and table 10/4.

Source: The Gallup Opinion Index, report No. 5, March 1974, Copyright by the American Institute of Public Opinion. Graph published in Social Indicators 1976, Bureau of Census, p. 492.

41. According to this graph, which leisure activity is by far the most popular among Americans?

(a) reading
(b) movies and theater
(c) watching TV
(d) dancing
(e) radio

42. What percent of the people surveyed in 1938 rated reading a favorite leisure activity?

(a) 43%
(b) 21%
(c) 10%
(d) 18%
(e) 52%

43. In what year did "movies and theater" receive their lowest rating?

(a) 1938
(b) 1960
(c) 1966
(d) 1974

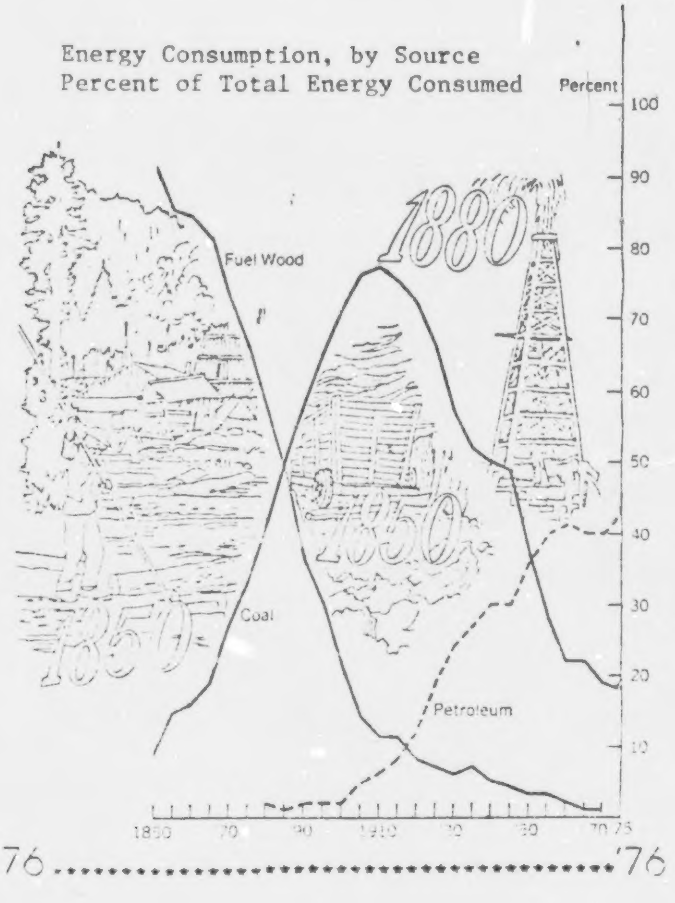
44. Excluding "Watching TV", what activity received the highest rating from Americans in 1960?

(a) reading
(b) movies and theater
(c) dancing
(d) radio
(e) staying home with family

45. Which of the following activities received a higher rating in 1960 than in 1938?

(a) reading
(b) movies and theater
(c) playing cards
(d) dancing
(e) visiting friends

Questions 46 through 50 refer to the graph below.



Energy Consumption, by Source
Percent of Total Energy Consumed

46. At its peak, coal comprised what percent of total energy consumed?

(a) 19%
(b) 50%
(c) 8%
(d) 78%
(e) 95%

47. In what year did coal and fuel wood each comprise approximately 50% of the energy consumed in the U.S.?

(a) 1850
(b) 1885
(c) 1917
(d) 1950
(e) 1970

48. What has the major source of energy consumed in the U.S. been in the 1970s?

(a) fuel wood
(b) coal
(c) petroleum

49. The point of intersection of two lines on this graph means:

(a) that those two energy sources both comprised half of the total energy consumed in the U.S.
(b) that each of those two energy sources have reached their peak in terms of the percent of total energy consumed
(c) that each of those two energy sources comprised the same percent of total energy consumed in the U.S. that year
(d) the total amount of coal and fuel wood consumed that year was the same
(e) that America dramatically changed its consumption practices that year

50. This graph indicates that:

(a) twice as much petroleum was being used as coal in 1975
(b) petroleum has not always been a major source of energy in the U.S.
(c) less coal was burned in 1945 than in 1930
(d) the proportion of total energy consumed by fuel wood has generally declined since 1850
(e) all of these

Questions 51 through 54 are based on the table below.

BEST COPY AVAILABLE

Vital Statistics, Health, and Nutrition

No. 67. Expectation of Life and Mortality Rates, by Age, Race, and Sex: 1967

AGE (years)	EXPECTATION OF LIFE IN YEARS					MORTALITY RATE PER 1,000 LIVING AT SPECIFIED AGE				
	Total	White		Negro and other		Total	White		Negro and other	
		Male	Female	Male	Female		Male	Female	Male	Female
Under 1	70.5	67.8	75.1	61.1	68.2	22.39	22.32	16.82	39.20	32.39
1	71.1	68.3	75.3	62.6	69.5	1.35	1.25	1.05	2.54	2.13
2	70.2	67.4	74.4	61.8	68.6	0.87	0.85	0.70	1.54	1.21
3	69.2	66.5	73.5	60.9	67.7	0.66	0.70	0.51	1.69	0.80
4	68.3	65.5	72.5	59.9	66.8	0.57	0.60	0.45	[illegible]	0.72
5	67.3	64.6	71.5	59.0	65.8	0.60	0.71	0.42	[illegible]	0.64
6	66.4	63.6	70.6	58.1	64.9	0.49	0.55	0.37	0.79	0.54
7	65.4	62.7	69.6	57.1	63.9	0.40	0.42	0.33	0.58	0.45
8	64.4	61.7	68.6	56.1	62.9	0.33	0.33	0.29	0.45	0.39
9	63.4	60.7	67.6	55.2	62.0	0.29	0.28	0.25	0.39	0.36
10	62.4	59.7	66.7	54.2	61.0	0.28	0.28	0.24	0.40	0.34
11	61.5	58.7	65.7	53.2	60.0	0.30	0.33	0.24	0.48	0.35
12	60.5	57.8	64.7	52.2	59.0	0.37	0.44	0.26	0.61	0.39
13	59.5	56.8	63.7	51.3	58.0	0.47	0.60	0.30	0.79	0.44
14	58.5	55.8	62.7	50.3	57.1	0.61	0.80	0.37	1.02	0.51
15	57.6	54.9	61.7	49.4	56.1	0.77	1.03	0.44	1.29	0.60
16	56.6	53.9	60.8	48.4	55.1	0.93	1.26	0.52	1.58	0.70
17	55.7	53.0	59.8	47.5	54.2	1.06	1.45	0.57	1.88	0.80
18	54.7	52.1	58.8	46.6	53.2	1.15	1.59	0.60	2.18	0.90
19	53.8	51.1	57.9	45.7	52.3	1.21	1.68	0.61	2.48	1.00
20	52.9	50.2	56.9	44.8	51.3	1.27	1.77	0.61	2.80	1.12
21	51.9	49.3	55.9	43.9	50.4	1.33	1.85	0.62	3.11	1.24
22	51.0	48.4	55.0	43.1	49.4	1.37	1.88	0.63	3.38	1.35
23	50.1	47.5	54.0	42.2	48.5	1.37	1.86	0.64	3.58	1.45
24	49.1	46.6	53.0	41.4	47.6	1.36	1.79	0.65	3.73	1.53
25	48.2	45.7	52.1	40.5	46.6	1.35	1.70	0.65	3.87	1.61
26	47.3	44.7	51.1	39.7	45.7	1.34	1.62	0.67	4.02	1.71
27	46.3	43.8	50.1	38.8	44.8	1.34	1.57	0.69	4.19	1.85
28	45.4	42.9	49.2	38.0	43.9	1.38	1.56	0.72	4.39	2.05
29	44.4	41.9	48.2	37.1	43.0	1.44	1.59	0.76	4.62	2.28
30	43.5	41.0	47.2	36.3	42.1	1.50	1.63	0.81	4.87	2.54
31	42.6	40.1	46.3	35.5	41.2	1.58	1.68	0.86	5.13	2.80
32	41.6	39.1	45.3	34.7	40.3	1.68	1.76	0.93	5.40	3.06
33	40.7	38.2	44.4	33.9	39.4	1.79	1.87	1.02	5.67	3.31
34	39.8	37.3	43.4	33.0	38.5	1.93	2.02	1.12	5.95	3.55
35	38.9	36.4	42.5	32.2	37.7	2.09	2.20	1.24	6.25	3.80
36	37.9	35.4	41.5	31.4	36.8	2.27	2.40	1.36	6.58	4.08
37	37.0	34.5	40.6	30.6	36.0	2.45	2.62	1.49	6.98	4.35
38	36.1	33.6	39.6	29.9	35.1	2.65	2.85	1.63	7.47	4.62
39	35.2	32.7	38.7	29.1	[illegible]	[illegible]	3.09	1.77	8.04	[illegible]
40	34.3	31.8	37.8	28.3	[illegible]	3.10	3.37	1.94	8.68	5.19
41	33.4	30.9	36.8	27.5	[illegible]	3.36	3.69	2.11	9.33	[illegible]
42	[illegible]	30.0	35.9	26.8	[illegible]	[illegible]	4.06	2.31	9.96	[illegible]
43	[illegible]	29.1	35.0	26.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
44	30.8	28.2	34.1	25.3	[illegible]	4.37	4.98	2.79	11.07	6.77
45	29.9	27.4	33.2	24.6	[illegible]	[illegible]	[illegible]	[illegible]	11.62	[illegible]
46	29.0	[illegible]	32.3	23.9	28.6	5.24	6.12	3.37	12.26	7.84
47	28.2	25.7	31.4	23.2	27.8	5.72	6.77	3.67	13.04	[illegible]
48	27.3	24.9	30.5	22.5	[illegible]	6.26	7.50	3.99	14.02	8.99
49	26.5	24.1	29.6	21.8	26.3	6.84	8.29	4.32	15.16	9.60
50	25.7	23.3	28.7	21.1	[illegible]	7.47	9.14	4.67	16.38	10.25
51	24.9	[illegible]	27.9	20.5	24.8	8.14	10.07	5.05	17.64	[illegible]
52	24.1	21.7	27.0	19.8	24.0	8.89	[illegible]	5.47	[illegible]	[illegible]
53	[illegible]	20.9	26.2	19.2	23.3	9.71	12.23	5.93	20.46	12.67
54	22.5	20.2	25.3	18.6	22.6	[illegible]	13.49	6.42	22.00	[illegible]
55	21.8	19.5	24.5	18.0	21.9	11.56	14.82	6.98	23.74	14.84
56	21.0	18.8	23.6	17.4	21.2	12.58	16.24	7.58	25.56	16.07
57	20.3	18.1	22.8	16.9	20.6	13.65	17.76	8.20	27.20	17.27
58	19.5	17.4	22.0	16.3	19.9	14.75	19.38	8.82	28.51	18.40
59	18.8	16.7	21.2	15.8	19.3	15.90	21.11	9.48	29.64	19.53
60	18.1	16.1	20.4	15.2	18.7	[illegible]	22.96	10.19	30.54	20.52
61	17.4	15.4	[illegible]	14.7	[illegible]	[illegible]	[illegible]	11.01	[illegible]	21.99
62	[illegible]	14.8	18.8	[illegible]	[illegible]	19.94	[illegible]	12.00	33.74	23.60
63	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13.21	[illegible]	[illegible]
64	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	23.58	31.32	14.62	41.64	30.33
65	14.8	[illegible]	16.5	[illegible]	[illegible]	[illegible]	33.61	16.17	[illegible]	[illegible]
66	[illegible]	12.5	[illegible]	[illegible]	[illegible]	27.79	[illegible]	17.84	52.10	38.95
67	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30.16	38.93	19.71	57.06	42.40
68	[illegible]	11.4	14.3	[illegible]	[illegible]	[illegible]	[illegible]	21.81	[illegible]	[illegible]
69	[illegible]	[illegible]	13.7	11.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] Dept. of Health, Education, and Welfare, Public Health Service, annual report, *Vital Statistics of the* [illegible]

51. If you were a black male aged 21 in 1967, how many years could you expect to live?

(a) 51.9

(b) 43.9

(c) 49.3

(d) 50.2

(e) 55.9

52. How many white males aged 67 die per 1000?

(a) 30.16

(b) 38.93

(c) 19.71

(d) 52.10

(e) 57.06

53. How many black females aged 67 die per 1000?

(a) 15.1

(b) 12.0

(c) 30.6

(d) 19.71

(e) 42.40

54. If you were a white female and had a life expectancy of 28.7 years in 1967, how old were you?

(a) 23.3

(b) 28.7

(c) 50.0

(d) 39.0

(e) 44.0

55. The population of an eastern city fell from 2,000 to 1,700 over the last 3 years. What was the percentage of decrease in the population?

(a) 20%
(b) 15%
(c) 10%
(d) 25%
(e) 50%

56. Percentages are useful when looking at change because they tell us?

(a) real numbers
(b) abstract numbers
(c) absolute change
(d) raw numbers
(e) proportions

57. In a city of 5,000 some 600 people are from Central and South America. The percentage of these people in the city is?

(a) 8%
(b) 10%
(c) 12%
(d) 15%
(e) 20%

DOLLARS SPENT ON MUNICIPAL SERVICES

	1950	1975
Police & Fire	$1,000	$1,500
Roads	1,000	1,600
Schools	4,010	6,000
Water	500	1,500
Insurance	100	200

58. In the table above, which of the services had the largest percentage increase in spending?

(a) police & fire
(b) schools
(c) road maintenance
(d) water treatment
(e) insurance

59. The fairest method of comparing the income increase in spending from 1950 to 1975 among the various services on the Municipal Services Table is to use:

(a) the mean increase for each service
(b) the median increase for each service
(c) the differences (subtract 1950 spending from 1975 spending)
(d) the range for each service
(e) the percentage change for each service

60. The median population size of the following cities is? City A--5,000; City B--6,275; City C--2,600,500; City D--19,680; City E--99,300.

(a) 99,300
(b) 6,275
(c) 18,200
(d) 19,680
(e) 546,151

61. If five people have incomes of $8,500; $9,000; $9,750; $11,200; and $13,500; the median income is?

(a) $9,000
(b) $9,750
(c) $9,500
(d) $10,000
(e) $10,250

62. Which measure of average is best to use when the data has extremely high or low scores?

(a) mean
(b) center
(c) median
(d) central tendency
(e) mode

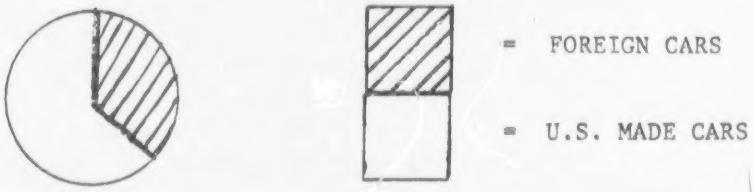
63. Which measure of average is a point above which are half of the scores and below which are the other half of the scores?

(a) mean
(b) median
(c) mode
(d) range
(e) central tendency

64. Circle graphs are best suited to presenting?

(a) raw numbers
(b) percentages
(c) total numbers
(d) absolute numbers
(e) whole numbers

THE U.S. NEW CAR MARKET, 1978



65. According to the graph above, what percentage of the new cars sold in the U.S. are made in foreign countries?

(a) 75%
(b) 50%
(c) 20%
(d) 25%
(e) 35%

AMERICAN GOVERNMENT

QUESST EVALUATION INSTRUMENT FOR PILOT TESTING

Part I: Attitude Survey

The purpose of this questionnaire is to help us to understand how you feel about the use of statistical ideas in social studies. We want your honest answer to each of the statements below. Read each statement and decide if you strongly agree, agree, disagree, strongly disagree, or are undecided. Mark your answer on the standard answer sheet provided. Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

This test will be scored by machine, so mark your answers by darkening in the space over the letter which best describes how you feel. If you change your mind, erase the old answer completely. You may mark only one response for each question. There are no right or wrong answers on this test. Mark the answers which best describe your own attitudes.

YOU HAVE ONLY 10 MINUTES TO COMPLETE THIS PART SO WORK RAPIDLY.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

1. Using statistics is fun.
2. I feel comfortable using statistics.
3. I usually skip over statistics when they appear in a reading.
4. Using statistics makes it difficult to answer social studies questions.
5. I usually hate it when people support their arguments with a lot of statistics.
6. I usually find statistics confusing.
7. America's citizens need more knowledge of how to interpret statistics.
8. Statistics as a school subject is boring.
9. Statistical concepts like mean, median, and percent are important to understanding social studies issues.
10. I often read material which could have been improved by including more statistics.
11. Most social issues and problems can be better understood when we look carefully at accurate statistics.
12. Statistics help me to understand subject matter better.
13. More people should learn how to use statistics.
14. Social studies is less interesting when you use statistical ideas.
15. A knowledge of statistics really doesn't help most people.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

16. Being able to understand statistics is important to learning social studies.

17. Using statistics is really hard for me.

18. I am suspicious of people's arguments if they cannot be supported with statistics.

19. I think it is important to check statistics when they are used in articles or textbooks.

20. Using statistics makes an idea less clear.

21. I often find it helpful to look at statistics when studying social studies.

22. Consumers could do a better job of shopping if they understood some basic statistical ideas.

23. Statistics are not mysterious.

24. Statistical ideas are not very useful in social studies.

25. Social studies as a subject is improved by including statistical ideas.

26. I don't see why we have to use statistics in social studies.

27. Having to use statistics is more trouble than its worth.

Part II. Statistical Knowledge

This is a test of your statistical knowledge. Like the first part of the QUESST Evaluation Instrument, it will also be machine scored.

Note that Part II begins with question number 41. Mark your answer for this question by darkening in the space over the letter which best answers that question. If you change your mind, erase the old answer completely. You may mark only one response for each question. Mark the answer which is most correct. Remeber, Part II of the test begins with question 41.

STATISTICAL KNOWLEDGE TEST

AMERICAN GOVERNMENT

41. Which of the following is not an important step in the survey process?

    (a) select a sample
    (b) analyze responses
    (c) design the questionnaire
    (d) conduct the survey
    (e) observe the experiment

42. Surveys may be conducted for all but which one of the following reasons?

    (a) to prove the cause of something
    (b) to measure how well satisfied people are
    (c) to collect facts
    (d) to identify people's reasons for particular feelings
    (e) to identify people's needs or wants

43. Which of the following questions can best be answered by conducting a survey?

    (a) How far will cars travel on a gallon of gas?
    (b) How long do people think they should be engaged before getting married?
    (c) How much heating oil should be produced next year?
    (d) What kind of chemical best preserves meat?
    (e) Where will the next major earthquake occur?

Questions 44 to 47 refer to the information about Survey Analysis below.

Four Ways to Analyze Surveys

A. Compare survey results with other information.

B. Compare responses to different questions.

C. Compare responses of members of different groups.

D. Compare responses at different times.

Directions: Match each of the findings below with the type of comparison it employs.

44. People who live in rural areas use available recreational facilities less often than those who live in urban areas.

A B C D

45. In early 1978, one opinion poll showed that 35% of the voting aged Americans surveyed opposed formal diplomatic relations with China. Later that year, that figure had dropped to 15%.

A B C D

46. Fifty percent of the students who said they felt all school sports should be eliminated also said that more money should be spent on buying additional library books.

A B C D

48. A recent FDA survey found that over 70% of the people surveyed were aware of dangerous cancer-causing chemicals in many of the products they used. Health Department studies, however, show that continued use of these products, and cancer is still this nation's leading cause of premature death.

A B C D

Questions 48 through 51 are based on the table below:

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Vital Statistics, Health, and Nutrition

No. 67. Expectation of Life and Mortality Rates, by Age, Race, and Sex: 1967

AGE (years)	EXPECTATION OF LIFE IN YEARS					MORTALITY RATE PER 1,000 LIVING AT SPECIFIED AGE				
	Total	White		Negro and other		Total	White		Negro and other	
		Male	Female	Male	Female		Male	Female	Male	Female
Under 1	70.5	67.8	75.1	61.1	68.2	22.39	22.32	16.82	39.20	32.39
1	71.1	68.3	75.3	62.6	69.5	1.35	1.25	1.05	2.54	2.13
2	70.2	67.4	74.4	61.8	68.6	0.87	0.85	0.70	1.56	1.21
3	69.2	66.5	73.5	60.9	67.7	0.66	0.70	0.51	1.09	0.80
4	68.3	65.5	72.5	59.9	66.8	0.57	0.60	0.45	0.90	0.72
5	67.3	64.6	71.5	59.0	65.3	0.60	0.71	0.42	1.08	0.64
6	66.4	63.6	70.6	58.1	64.9	0.49	0.55	0.37	0.79	0.54
7	65.4	62.7	89.6	57.1	63.9	0.40	0.42	0.33	0.58	0.45
8	64.4	61.7	68.6	56.1	62.9	0.33	0.33	0.29	0.45	0.39
9	63.4	60.7	67.6	55.2	62.0	0.29	0.28	0.25	0.39	0.36
10	62.4	59.7	66.7	54.2	61.0	0.28	0.28	0.24	0.40	0.34
11	61.5	58.7	65.7	53.2	60.0	0.30	0.33	0.24	0.48	0.35
12	60.5	57.8	64.7	52.2	59.0	0.37	0.44	0.26	0.61	0.39
13	59.5	56.8	63.7	51.3	58.0	0.47	0.60	0.30	0.79	0.44
14	58.5	55.8	62.7	50.3	57.1	0.61	0.80	0.37	1.02	0.51
15	57.6	54.9	61.7	49.4	56.1	0.77	1.03	0.44	1.29	0.60
16	56.6	53.9	60.8	48.4	55.1	0.93	1.26	0.52	1.58	0.70
17	55.7	53.0	59.8	47.5	54.2	1.06	1.45	0.57	1.88	0.80
18	54.7	52.1	58.8	46.6	53.2	1.15	1.59	0.60	2.18	0.90
19	53.8	51.1	57.9	45.7	52.3	1.21	1.68	0.61	2.48	1.00
20	52.9	50.2	56.9	44.8	51.3	1.27	1.77	0.61	2.80	1.12
21	51.9	49.3	55.9	43.9	50.4	1.33	1.85	0.62	3.11	1.24
22	51.0	48.4	55.0	43.1	49.4	1.37	1.88	0.63	3.38	1.35
23	50.1	47.5	54.0	42.2	48.5	1.37	1.86	0.64	3.58	1.45
24	49.1	46.6	53.0	41.4	47.6	1.36	1.79	0.65	3.73	1.53
25	48.2	45.7	52.1	40.5	46.6	1.35	1.70	0.65	3.87	1.61
26	47.3	44.7	51.1	39.7	45.7	1.34	1.62	0.67	4.02	1.71
27	46.3	43.8	50.1	38.8	44.8	1.34	1.57	0.69	4.19	1.85
28	45.4	42.9	49.2	38.0	43.9	1.38	1.56	0.72	4.39	2.05
29	44.4	41.9	48.2	37.1	43.0	1.44	1.59	0.76	4.62	2.28
30	43.5	41.0	47.2	36.3	42.1	1.50	1.63	0.81	4.87	2.54
31	42.6	40.1	46.3	35.5	41.2	1.58	1.68	0.86	5.13	2.80
32	41.6	39.1	45.3	34.7	40.3	1.68	1.76	0.93	5.40	3.06
33	40.7	38.2	44.4	33.9	39.4	1.79	1.87	1.02	5.67	3.31
34	39.8	37.3	43.4	33.0	38.5	1.93	2.02	1.12	5.95	3.55
35	38.9	36.4	42.5	32.2	37.7	2.09	2.20	1.21	6.25	3.80
36	37.9	35.4	41.5	31.4	36.8	2.27	2.40	1.36	6.58	4.08
37	37.0	34.5	40.6	30.6	36.0	2.45	2.62	1.49	6.98	4.35
38	36.1	33.6	39.6	29.9	35.1	2.65	2.85	1.63	7.47	4.62
39	35.2	32.7	38.7	29.1	34.3	2.86	3.09	1.77	8.04	4.90
40	34.3	31.8	37.8	28.3	33.4	3.10	3.37	1.94	8.68	5.19
41	33.4	30.9	36.8	27.6	32.6	3.36	3.69	2.11	9.33	5.50
42	32.5	30.0	35.9	26.8	31.8	3.66	4.06	2.31	9.96	5.87
43	31.6	29.1	35.0	26.1	31.0	4.00	4.49	2.54	10.53	6.29
44	30.8	28.3	34.1	25.3	30.2	4.37	4.98	2.79	11.07	6.77
45	29.9	27.4	33.2	24.6	29.4	4.78	5.52	3.07	11.62	7.29
46	29.0	26.6	32.3	23.9	28.6	5.23	6.12	3.37	12.26	7.84
47	28.2	25.7	31.1	23.2	27.8	5.72	6.77	3.67	13.04	8.41
48	27.3	24.9	30.5	22.5	27.0	6.26	7.50	3.99	14.02	8.99
49	26.5	24.1	29.6	21.8	26.3	6.84	8.29	4.32	15.16	9.60
50	25.7	23.3	28.7	21.1	25.5	7.47	9.14	4.67	16.38	10.2[illegible]
51	24.9	22.5	27.9	20.5	24.8	8.14	10.07	5.05	17.64	10.[illegible]
52	24.1	21.7	27.0	19.8	24.0	8.89	11.09	5.47	[illegible]	11.[illegible]
53	23.3	20.9	26.2	19.2	23.3	9.71	12.23	5.93	20.46	12.67
54	22.5	20.2	25.3	18.6	22.6	10.59	13.49	6.42	22.00	13.69
55	21.8	19.5	24.5	18.0	21.9	11.56	14.82	6.98	23.74	14.84
56	21.0	18.8	23.6	17.4	21.2	12.58	16.24	7.58	25.56	16.07
57	20.3	18.1	22.8	16.9	20.6	13.65	17.76	8.20	27.[illegible]	17.27
58	19.5	17.4	22.0	16.3	19.9	14.75	19.38	8.82	28.51	18.40
59	18.8	16.7	21.2	15.8	19.3	15.90	21.11	9.48	29.64	19.53
60	18.1	16.1	20.4	15.3	18.7	17.12	22.96	10.19	30.54	20.52
61	17.4	15.4	19.6	14.7	18.1	18.44	24.93	11.01	31.69	21.69
62	16.7	14.8	18.8	14.2	17.5	19.94	26.98	12.00	33.74	23.60
63	16.1	14.2	18.0	13.7	16.9	21.66	29.10	13.2[illegible]	37.13	26.56
64	15.4	13.6	17.3	13.2	16.3	23.58	31.32	14.62	41.64	30.33
65	14.8	13.0	16.5	12.7	15.8	25.62	33.61	16.17	46.85	34.69
66	14.2	12.5	15.8	12.3	15.4	27.79	36.07	17.84	52.10	38.95
67	13.5	11.9	15.1	12.0	15.0	30.16	38.93	19.71	57.06	42.40
68	13.0	11.4	14.3	11.7	14.6	32.76	42.34	21.81	61.22	44.39
69	12.4	10.9	13.7	11.4	14.3	35.59	46.24	24.13	64.63	45.13

Source: Dept. of Health, Education, and Welfare, Public Health Service; annual report, *Vital Statistics of the United States*.

48. If you were a black male aged 21 in 1967, how many years could you expect to live?

(a) 51.9

(b) 43.9

(c) 49.3

(d) 50.2

(e) 55.9

49. How many white males aged 67 die per 1000?

(a) 30.16

(b) 38.93

(c) 19.71

(d) 52.10

(e) 57.06

50. How many black females aged 67 die per 1000?

(a) 15.1

(b) 12.0

(c) 30.6

(d) 19.71

(e) 42.4[illegible]

51. If you were a white female and had a life expectancy of 28.7 years in 1967, how old were you?

(a) 23.3

(b) 28.7

(c) 50.0

(d) 39.0

(e) 44.0

Questions 52 through 54 are based on the table below.

FAMILY INCOME BY EDUCATION AND RACE

RACE OF FAMILY HEAD AND TYPE OF SCHOOL COMPLETED	MEDIAN INCOME	
	1961	1968
WHITE FAMILIES	$6100	$9179
Elementary School	4419	6328
High School (4 years)	6548	9680
College (4 or more years)	9503	13,589
BLACK AND OTHER FAMILIES	$3340	$5684
Elementary School	2593	4297
High School (4 years)	4773	7057
College (4 or more years)	*	12,472

*Less than 200,000 persons in this category. Therefore, the data is not reported in the Statistical Abstract of the U.S., 1977, p. 325.

52. What was the median income for black and other families in 1961?

(a) $2593
(b) $3340
(c) $9503
(d) $2875
(e) $5684

53. What was the median income in 1968 of white families whose head completed four years of high school?

(a) $6100
(b) $9179
(c) $6328
(d) $13,589
(e) $9680

54. In which of the following categories are the incomes between whites and blacks the closest?

(a) elementary school in 1961

(b) elementary school in 1968

(c) high school in 1961

(d) college in 1968

(e) high school in 1968

55. Which of the following is the least effective way of identifying a representative sample of a town's population?

(a) drawing names from a hat

(b) selecting one person for each city block

(c) picking only people whose first names are John or Mary

(d) picking five names from each page of the phone directory

(e) picking every 3rd name off the utility bill list

56. Which of the following is an example of a stratified sample of a school's population?

(a) all seventh graders were selected

(b) 10% of seventh graders were selected

(c) 10% of students in each grade were selected

(d) all student names were put in a box, and 20% were selected

(e) 50% of the students were selected

57. Which of the following is true about using samples?

(a) information is more difficult to collect

(b) different kinds of samples give the same estimated values

(c) it takes more time than studying the entire population

(d) it is the only practical way of getting some kinds of information

(e) the degree to which a sample is accurately representing the population is never known

58. The Dr. Johnson Aspirin Company did a survey to find out what kinds of people in the U.S. used their product. They surveyed 750 people from large cities, 150 people from small towns, and 100 people from rural places. This is an example of:

(a) stratified sampling

(b) random sampling

(c) systematic sampling

(d) interviewing a population

(e) scientific sampling

59. Gasoline use goes up with increases in leisure time. This is an example of:

(a) random association
(b) a negative correlation
(c) a range or distribution
(d) a positive correlation
(e) a survey result

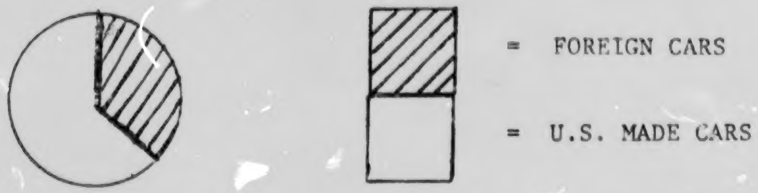
60. When average income increases, cases of serious illness tend to decrease. This is an example of:

(a) random association
(b) a negative correlation
(c) a range or distribution
(d) a positive correlation
(e) a cause-effect relationship

61. Circle graphs are best suited to presenting?

(a) raw numbers
(b) percentages
(c) total numbers
(d) absolute numbers
(e) whole numbers

THE U.S. NEW CAR MARKET, 1978

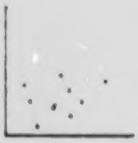


62. According to the graph above, what percentage of the new cars sold in the U.S. are made in foreign countries?

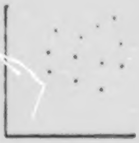
(a) 75%
(b) 50%
(c) 20%
(d) [illegible]5%
(e) 35%

63. Which of the correlations illustrated on the scatter diagrams below is strongest?

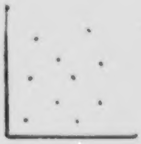
(a)



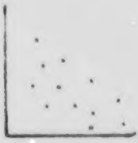
(b)



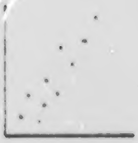
(c)



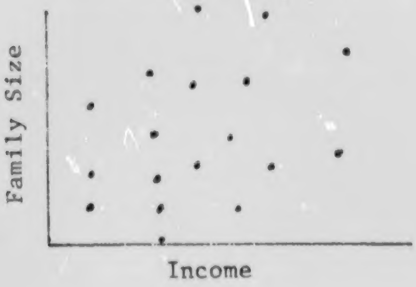
(d)



(e)



Families and Their Income



64. What do the dots represent in the scatter diagram "Families and Their Income"?

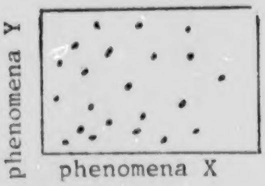
(a) family earning potential

(b) money earned by each family member

(c) specific families

(d) what families should earn

(e) all of the above



65. The scatter diagram above represents:

(a) a close positive correlation

(b) a close negative correlation

(c) both a close positive and close negative correlation

(d) neither a close positive or negative correlation

(e) no apparent association

AMERICAN LIFESTYLE CHANGES

QUESST EVALUATION INSTRUMENT
FOR PILOT TESTING

Part I: Attitude Survey

The purpose of this questionnaire is to help us to understand how you feel about the use of statistical ideas in social studies. We want your honest answer to each of the statements below. Read each statement and decide if you strongly agree, agree, disagree, strongly disagree, or are undecided. Mark your answer on the standard answer sheet provided. Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

This test will be scored by machine, so mark your answers by darkening in the space over the letter which best describes how you feel. If you change your mind, erase the old answer completely. You may mark only one response for each question. There are no right or wrong answers on this test. Mark the answers which best describe your own attitudes.

YOU HAVE ONLY 10 MINUTES TO COMPLETE THIS PART SO WORK RAPIDLY.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

1. Using statistics is fun.
2. I feel comfortable using statistics.
3. I usually skip over statistics when they appear in a reading.
4. Using statistics makes it difficult to answer social studies questions.
5. I usually hate it when people support their arguments with a lot of statistics.
6. I usually find statistics confusing.
7. America's citizens need more knowledge of how to interpret statistics.
8. Statistics as a school subject is boring.
9. Statistical concepts like mean, median, and percent are important to understanding social studies issues.
10. I often read material which could have been improved by including more statistics.
11. Most social issues and problems can be better understood when we look carefully at accurate statistics.
12. Statistics help me to understand subject matter better.
13. More people should learn how to use statistics.
14. Social studies is less interesting when you use statistical ideas.
15. A knowledge of statistics really doesn't help most people.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

16. Being able to understand statistics is important to learning social studies.

17. Using statistics is really hard for me.

18. I am suspicious of people's arguments if they cannot be supported with statistics.

19. I think it is important to check statistics when they are used in articles or textbooks.

20. Using statistics makes an idea less clear.

21. I often find it helpful to look at statistics when studying social studies.

22. Consumers could do a better job of shopping if they understood some basic statistical ideas.

23. Statistics are not mysterious.

24. Statistical ideas are not very useful in social studies.

25. Social studies as a subject is improved by including statistical ideas.

26. I don't see why we have to use statistics in social studies.

27. Having to use statistics is more trouble than its worth.

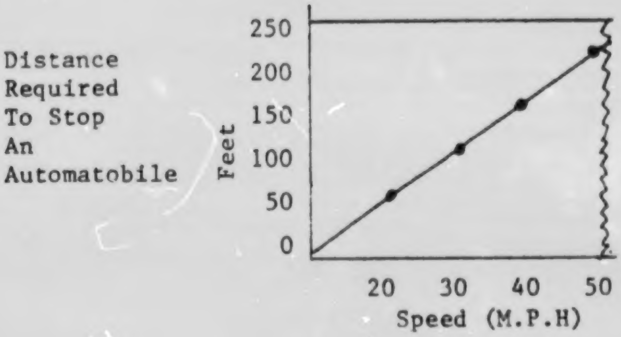
Part II. Statistical Knowledge

This is a test of your statistical knowledge. Like the first part of the QUESST Evaluation Instrument, it will also be machine scored.

Note that Part II begins with question number 41. Mark your answer for this question by darkening in the space over the letter which best answers that question. If you change your mind, erase the old answer completely. You may mark only one response for each question. Mark the answer which is most correct. Remeber, Part II of the test begins with question 41.

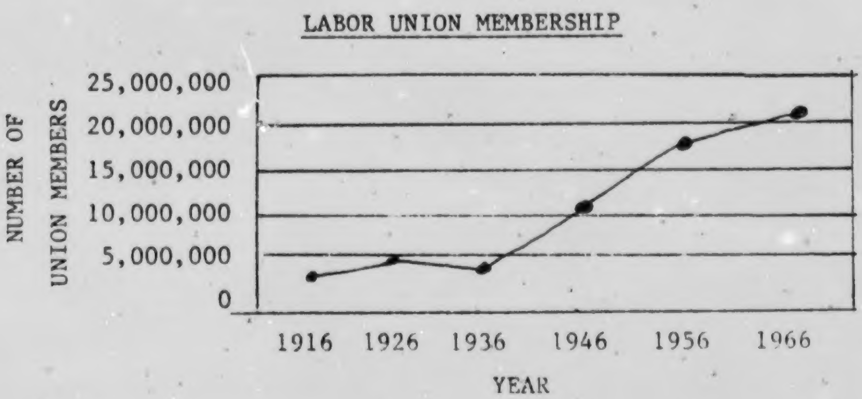
STATISTICAL KNOWLEDGE TEST

AMERICAN LIFESTYLE CHANGES



41. What seems to be the most reasonable estimate for the distance required to stop at 55 m.p.h.?

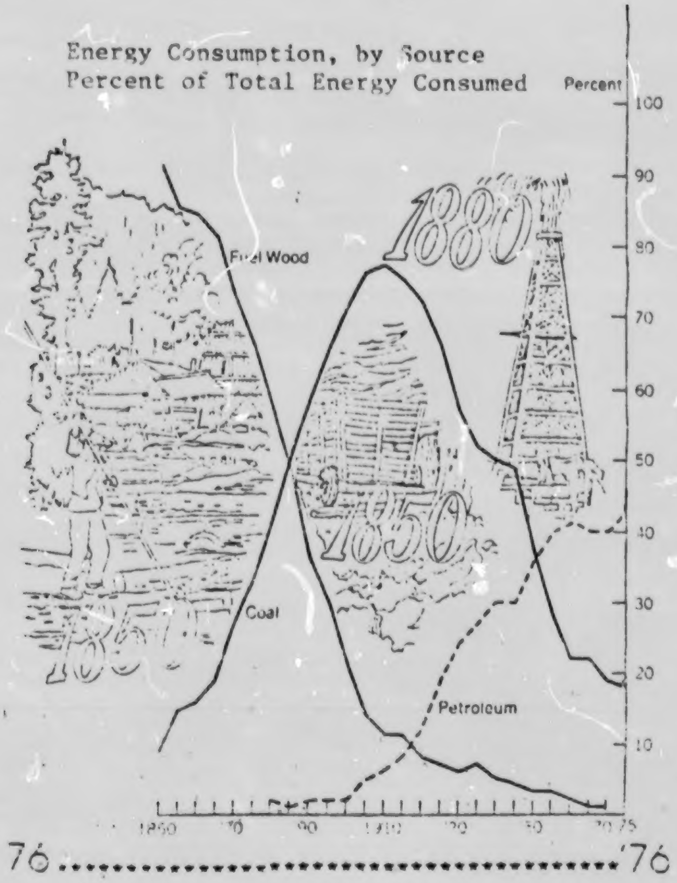
    (a) 200 feet
    (b) 240 feet
    (c) 300 feet
    (d) 220 feet
    (e) 380 feet



42. According to the graph above, what was the union membership in 1926?

    (a) 2,000,000
    (b) 3,500,000
    (c) 4,990,000
    (d) 5,500,000
    (e) 4,800,000

Questions 43 through 44 refer to the graph below.



Energy Consumption, by Source
Percent of Total Energy Consumed

43. At its peak, coal comprised what percent of total energy consumed?

    (a) 19%
    (b) 50%
    (c) 8%
    (d) 78%
    (e) 95%

44. In what year did coal and fuel wood each comprise approximately 50% of the energy consumed in the U.S.?

    (a) 1850
    (b) 1885
    (c) 1917
    (d) 1950
    (e) 1970

Questions 45 through 46 are based on the table below.

Team X		Team Y		Team Z	
Players 1	$100,000	Player 1	$120,000	Player 1	$80,000
Player 2	60,000	Player 2	100,000	Player 2	60,000
Player 3	55,000	Player 3	85,000	Player 3	40,000
Player 4	50,000	Player 4	75,000	Player 4	15,000
Player 5	40,000	Player 5	75,000		
		Player 6	70,000		
TOTAL	$305,000	TOTAL	$525,000	TOTAL	$195,000

45. What is the median income for Team X?

(a) $61,000
(b) $55,000
(c) $52,500
(d) $50,000
(e) $48,000

46. What is the median income for Team Y?

(a) $75,000
(b) $85,000
(c) $100,000
(d) $80,000
(e) $72,500

Speeds and Weights of Selected Items

Tank (45 m.p.h.) 120,000 lbs.

Racing motorcycle (140 m.p.h.) 800 lbs.

A man walking (5 m.p.h.) 180 lbs.

A crawling worm (1/20 m.p.h.) 2 oz.

Jet fighter (2,300 m.p.h.) 20,000 lbs.

World War II fighter plane (400 m.p.h.) .10,000 lbs.

A thrown football (35 m.p.h.) 1 lb.

47. If the items above were rank ordered by speed which one would be 3rd fastest?

(a) racing motorcycle
(b) a walking man
(c) a football
(d) a jet fighter
(e) World War II fighter plane

48. If the items were rank ordered from heaviest to lightest, which would be the #2 item?

(a) tank
(b) World War II fighter plane
(c) jet fighter
(d) racing motorcycle
(e) a football

49. Which is the most accurate rank order of the following nations from most urban to least urban? Japan = 72% urban, South Korea = 41% urban, China = 23% urban, and Singapore = 100% urban.

(a)	(b)	(c)	(d)	(e)
Japan	South Korea	Singapore	China	Singapore
South Korea	Japan	Japan	Singapore	Japan
China	Singapore	South Korea	Japan	China
Singapore	China	China	South Korea	South Korea

50. The population of an eastern city fell from 2,000 to 1,700 over the last 3 years. What was the percentage of decrease in the population?

(a) 20%

(b) 15%

(c) 10%

(d) 25%

(e) 50%

51. Percentages are useful when looking at change because they tell us?

(a) real numbers

(b) abstract numbers

(c) absolute change

(d) raw numbers

(e) proportions

52. In a city of 5,000 some 600 people are from Central and South America. The percentage of these people in the city is?

(a) 8%

(b) 10%

(c) 12%

(d) 15%

(e) 20%

DOLLARS SPENT ON MUNICIPAL SERVICES

	1950	1975
Police & Fire	$1,000	$1,500
Roads	1,000	1,600
Schools	4,010	6,000
Water	500	1,500
Insurance	100	200

53. In the table above, which of the services had the largest percentage increase in spending?

(a) police & fire

(b) schools

(c) road maintenance

(d) water treatment

(e) insurance

54. When average income increases, cases of serious illness tend to decrease. This is an example of:

(a) random association

(b) a negative correlation

(c) a range or distribution

(d) a positive correlation

(e) a cause-effect relationship

55. Gasoline use goes up with increases in leisure time. This is an example of:

(a) random association

(b) a negative correlation

(c) a range or distribution

(d) a positive correlation

(e) a survey result

56. The median population size of the following cities is? City A--5,000; City B--6,275; City C--2,600,500; City D--19,680; City E--99,300.

(a) 99,300
(b) 6,275
(c) 18,200
(d) 19,680
(e) 546,151

57. If five people have incomes of $8,500; $9,000; $9,750; $11,200; and $13,500, the median income is?

(a) $9,000
(b) $9,750
(c) $9,500
(d) $10,000
(e) $10,250

58. Which measure of average is best to use when the data has extremely high or low scores?

(a) mean
(b) center
(c) median
(d) central tendency
(e) mode

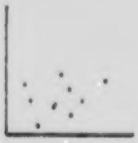
59. Which measure of average is a point above which are half of the scores and below which are the other half of the scores?

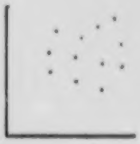
(a) mean
(b) median
(c) mode
(d) range
(e) central tendency

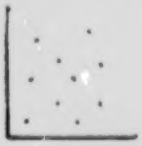
60. Based on current size and growth rate projections, a city's population in the year 2000 will be slightly over 1 million. The figure of 1 million is an?

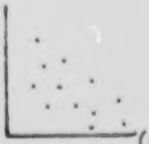
(a) prediction
(b) real population size
(c) estimate
(d) guess
(e) choice

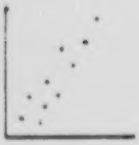
61. Which of the correlations illustrated on the scatter diagrams below is strongest?

(a)


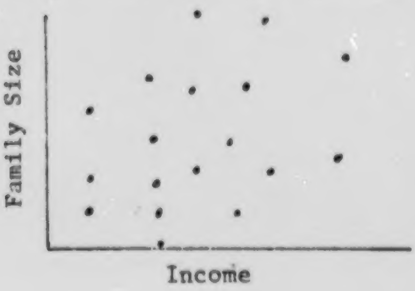
(b)


(c)


(d)


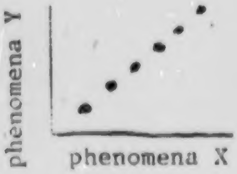
(e)


Families and Their Income



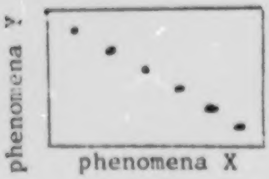
62. What do the dots represent in the scatter diagram "Families and Their Income"?

(a) family earning potential
(b) money earned by each family member
(c) specific families
(d) what families should earn
(e) all of the above



63. The scatter diagram above represents:

(a) a close positive correlation
(b) a close negative correlation
(c) both a close positive and close negative correlation
(d) neither a close positive or negative correlation
(e) a random distribution



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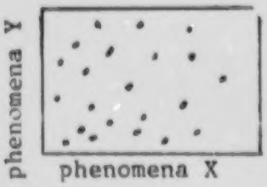

65. The scatter diagram above represents:

(a) a close positive correlation
(b) a close negative correlation
(c) both a close positive and close negative correlation
(d) neither a close positive or negative correlation
(e) no apparent association

ECONOMIC ISSUES IN THE U.S.

QUESST EVALUATION INSTRUMENT
FOR PILOT TESTING

Part I: Attitude Survey

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(B) = Agree
(C) = Undecided
(D) = Disagree
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1. Using statistics is fun.
2. I feel comfortable using statistics.
3. I usually skip over statistics when they appear in a reading.
4. Using statistics makes it difficult to answer social studies questions.
5. I usually hate it when people support their arguments with a lot of statistics.
6. I usually find statistics confusing.
7. America's citizens need more knowledge of how to interpret statistics.
8. Statistics as a school subject is boring.
9. Statistical concepts like mean, median, and percent are important to understanding social studies issues.
10. I often read material which could have been improved by including more statistics.
11. Most social issues and problems can be better understood when we look carefully at accurate statistics.
12. Statistics help me to understand subject matter better.
13. More people should learn how to use statistics.
14. Social studies is less interesting when you use statistical ideas.
15. A knowledge of statistics really doesn't help most people.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
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16. Being able to understand statistics is important to learning social studies.

17. Using statistics is really hard for me.

18. I am suspicious of people's arguments if they cannot be supported with statistics.

19. I think it is important to check statistics when they are used in articles or textbooks.

20. Using statistics makes an idea less clear.

21. I often find it helpful to look at statistics when studying social studies.

22. Consumers could do a better job of shopping if they understood some basic statistical ideas.

23. Statistics are not mysterious.

24. Statistical ideas are not very useful in social studies.

25. Social studies as a subject is improved by including statistical ideas.

26. I don't see why we have to use statistics in social studies.

27. Having to use statistics is more trouble than its worth.

Part II. Statistical Knowledge

This is a test of your statistical knowledge. Like the first part of the QUESST Evaluation Instrument, it will also be machine scored.

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STATISTICAL KNOWLEDGE TEST

ECONOMIC ISSUES IN THE U.S.

DOLLARS SPENT ON MUNICIPAL SERVICES

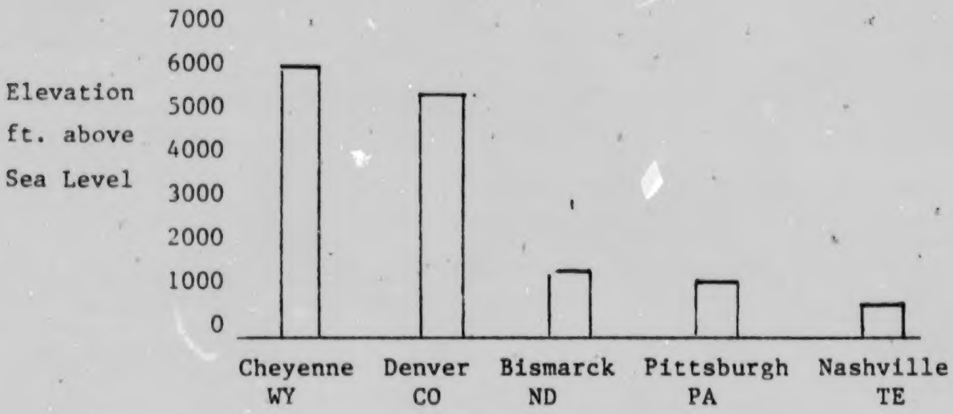
	1950	1975
Police & Fire	$1,000	$1,500
Roads	1,000	1,600
Schools	4,010	6,000
Water	500	1,500
Insurance	100	200

41. In the table above, which of the services had the largest percentage increase in spending?

(a) police & fire
(b) schools
(c) road maintenance
(d) water treatment
(e) insurance

42. The most concise way to indicate changing salaries over a period of ten years is to present the data in:

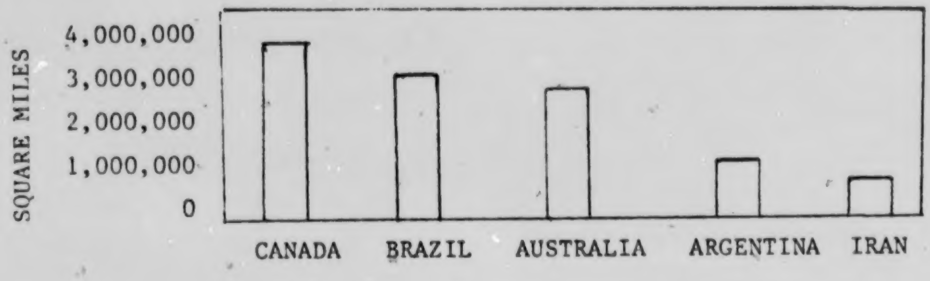
(a) a circle graph
(b) a written paragraph
(c) a continuum
(d) a bar graph
(e) a rank order



43. The elevation of Bismarck appears to be about ______feet above sea level.
   (a) 1000
   (b) 1300
   (c) 1800
   (d) 2000
   (e) 800

44. The elevation of Pittsburg appears to be about ______feet above sea level.
   (a) 1000
   (b) 1100
   (c) 1500
   (d) 1600
   (e) 100

AREA OF SELECTED COUNTRIES



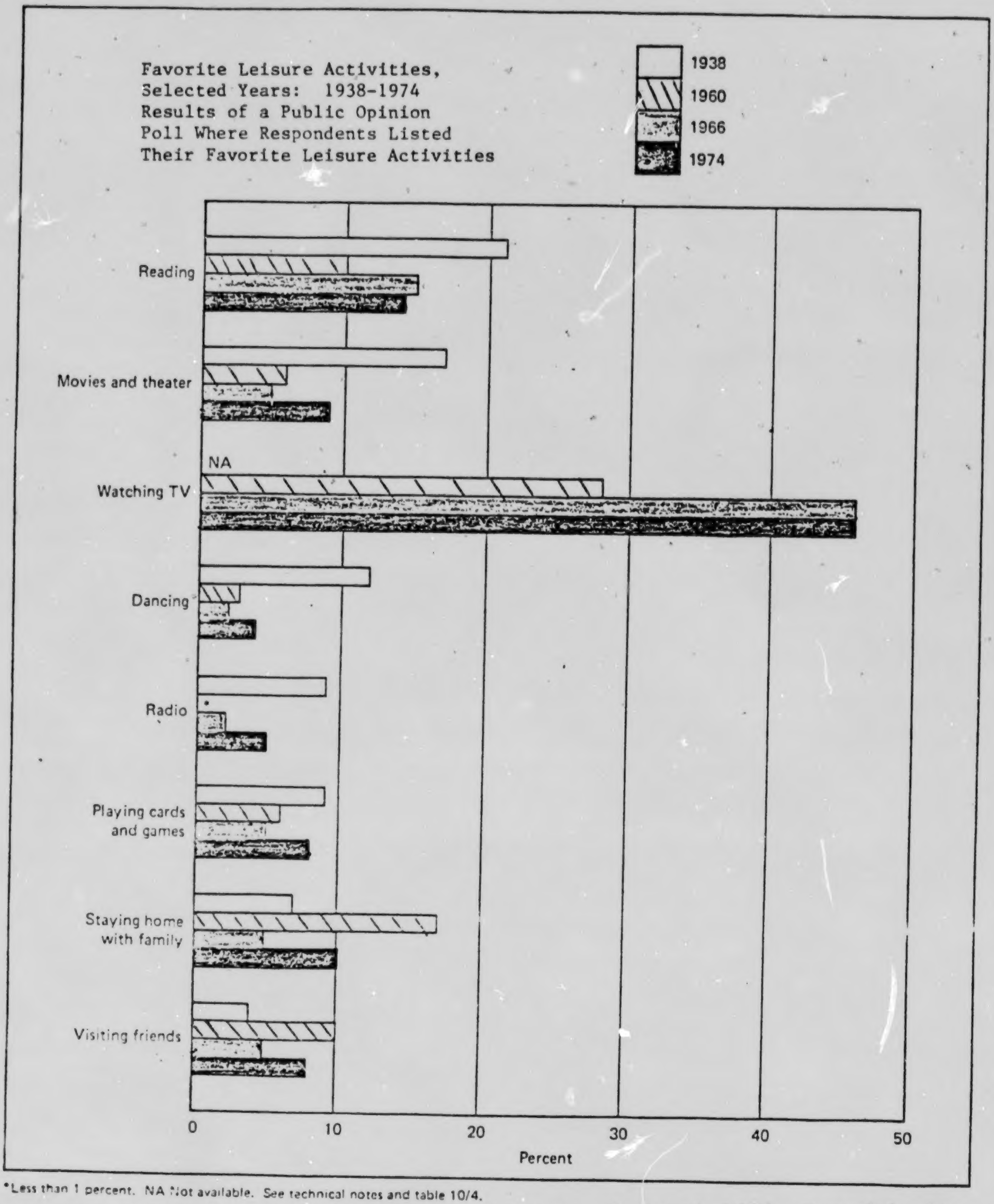
45. According to this graph, the area of Brazil is:

(a) 3,086,490
(b) 3,426,940
(c) 3,647,610
(d) 2,790,000
(e) 2,876,540

46. What is the major weakness of the mean?

(a) it is not a good measure of average
(b) it is unreliable
(c) it is not a real number
(d) it is hard to calculate
(e) it is affected by extreme scores

Question #47 refers to the graph below.



Favorite Leisure Activities,
Selected Years: 1938-1974
Results of a Public Opinion
Poll Where Respondents Listed
Their Favorite Leisure Activities

*Less than 1 percent. NA Not available. See technical notes and table 10/4.

Source: The Gallup Opinion Index, report No. 5, March 1974, Copyright by the American Institute of Public Opinion. Graph published in Social Indicators 1976, Bureau of Census, p. 492.

47. The data on this graph indicate that:

(a) watching TV was a favorite leisure activity of the majority of Americans in 1966 and 1974.

(b) most Americans watched a lot of TV in 1966 and 1974.

(c) more than 10% of the Americans polled played cards and games in the 4 years covered.

(d) more than 10 times as many Americans rated dancing as a favorite activity than watching TV in 1938.

(e) more than twice as many Americans in 1974 rated listening to the radio as a favorite activity as in 1966.

48. Which measure of average is most influenced by extreme scores?

(a) center
(b) mode
(c) central tendency
(d) median
(e) mean

49. Which measure of average is an arithmetic average?

(a) mode
(b) median
(c) control tendency
(d) range
(e) mean

50. If five people have incomes of $8,500; $9,000; $9,750; $11,200; and $13,500; the median income is?

(a) $9,000
(b) $9,750
(c) $9,500
(d) $10,000
(e) $10,250

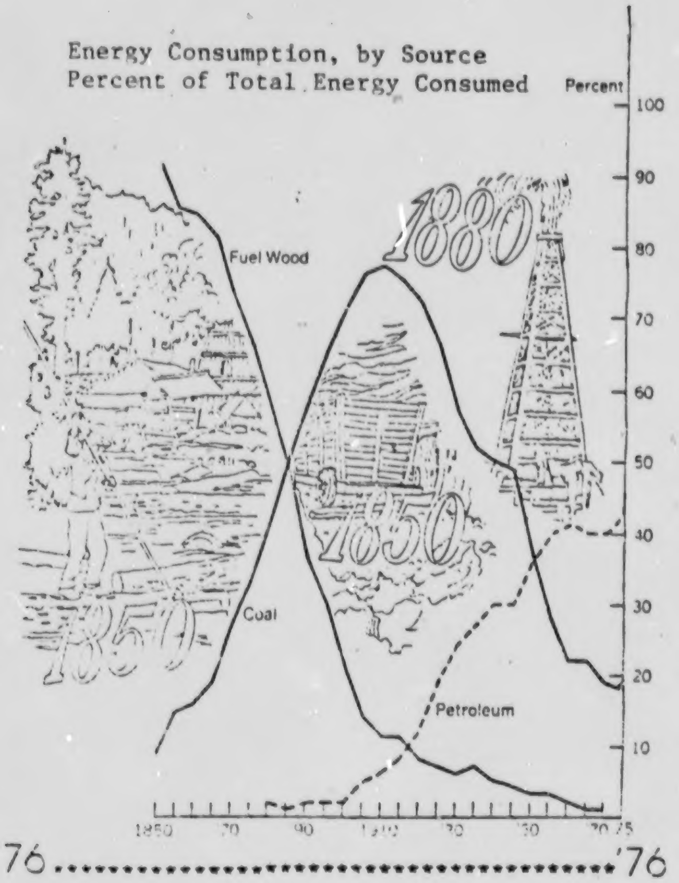
51. Which measure of average is best to use when the data has extremely high or low scores?

(a) mean
(b) center
(c) median
(d) central tendency
(e) mode

52. Which measure of average is a point above which are half of the scores and below which are the other half of the scores?

(a) mean
(b) median
(c) mode
(d) range
(e) central tendency

Questions 53 through 54 refer to the graph below.



Energy Consumption, by Source
Percent of Total Energy Consumed

53. The point of intersection of two lines on this graph means:

(a) that those two energy sources both comprised half the total energy consumed in the U.S.

(b) that each of those two energy sources have reached their peak in terms of the percent of total energy consumed

(c) that each of those two energy sources comprised the same percent of total energy consumed in the U.S. that year

(d) the total amount of coal and fuel wood consumed that year was the same

(e) that America dramatically changed its consumption practices that year

54. This graph indicates that:

(a) twice as much petroleum was being used as coal in 1975

(b) petroleum has not always been a major source of energy in the U.S.

(c) less coal was burned in 1945 than in 1930

(d) the proportion of total energy consumed by fuel wood has generally declined since 1850

(e) all of these

Questions 55 through 60 are based on the table below.

Team X		Team Y		Team Z	
Players 1	$100,000	Player 1	$120,000	Player 1	$80,000
Player 2	60,000	Player 2	100,000	Player 2	60,000
Player 3	55,000	Player 3	85,000	Player 3	40,000
Player 4	50,000	Player 4	75,000	Player 4	15,000
Player 5	40,000	Player 5	75,000		
		Player 6	70,000		
TOTAL	$305,000	TOTAL	$525,000	TOTAL	$195,000

55. What is the mean income for Team X?

(a) $61,000
(b) $55,000
(c) $52,500
(d) $80,000
(e) $48,000

56. What is the median income for Team X?

(a) $61,000
(b) $55,000
(c) $52,500
(d) $50,000
(e) $48,000

57. What is the median income for Team Y?

(a) $75,000
(b) $85,000
(c) $100,000
(d) $80,000
(e) $72,500

58. Which team has the largest range of incomes?

(a) Team X
(b) Team Y
(c) Team Z

59. Which team has the smallest range of incomes?

(a) Team X
(b) Team Y
(c) Team Z

60. Suppose the income of Player 1 on Team X was raised to $200,000 while the incomes of the other players remained the same. Which of the following would not be affected by that change?

(a) Team X's mean income

(b) Team X's median income

(c) Team X's range of incomes

61. One weakness of an index is that it:

(a) uses two or more measures which are not always of equal importance

(b) does not allow us to make comparisons

(c) can be used only with a small variety of topics

(d) does not allow for the observation of trends and patterns over a given period of time

(e) does not allow us to make estimates about the future

62. The range of a distribution of numbers is:

(a) the difference between the highest score and lowest score

(b) the size of the average

(c) the number of cases being studied

(d) the percent of cases over the average

(e) the absolute number of cases on either side of the median

63. Which of the following distributions has the largest range?

(a) dress sizes in Mrs. Hoivala's eighth grade class

(b) numbers of goals scored by players on the Toronto Maple Leafs hockey team

(c) annual incomes of people in Atlanta, Georgia

(d) shoe sizes of players on the Dallas Cowboys football team

(e) number of wins among National Football League teams in 1978

64. The range in annual population growth rates for countries of the Middle East is 2.9%. The smallest growth rate of any country in the region is 0.8%. What is the highest growth rate?

(a) 0.8

(b) 3.7

(c) 2.9

(d) 2.1

(e) 2.5

65. Joe Smith is a teacher and has earned salaries of $12,000, $12,750, $13,450, $14,250, and $15,000 in each of the past five years. The range in his salary during that period is:

(a) $12,000

(b) $15,000

(c) $13,450

(d) $3,000

(e) $1,500

ENERGY ISSUES

QUESST EVALUATION INSTRUMENT FOR PILOT TESTING

Part I: Attitude Survey

The purpose of this questionnaire is to help us to understand how you feel about the use of statistical ideas in social studies. We want your honest answer to each of the statements below. Read each statement and decide if you strongly agree, agree, disagree, strongly disagree, or are undecided. Mark your answer on the standard answer sheet provided. Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

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YOU HAVE ONLY 10 MINUTES TO COMPLETE THIS PART SO WORK RAPIDLY.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

1. Using statistics is fun.
2. I feel comfortable using statistics.
3. I usually skip over statistics when they appear in a reading.
4. Using statistics makes it difficult to answer social studies questions.
5. I usually hate it when people support their arguments with a lot of statistics.
6. I usually find statistics confusing.
7. America's citizens need more knowledge of how to interpret statistics.
8. Statistics as a school subject is boring.
9. Statistical concepts like mean, median, and percent are important to understanding social studies issues.
10. I often read material which could have been improved by including more statistics.
11. Most social issues and problems can be better understood when we look carefully at accurate statistics.
12. Statistics help me to understand subject matter better.
13. More people should learn how to use statistics.
14. Social studies is less interesting when you use statistical ideas.
15. A knowledge of statistics really doesn't help most people.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

16. Being able to understand statistics is important to learning social studies.

17. Using statistics is really hard for me.

18. I am suspicious of people's arguments if they cannot be supported with statistics.

19. I think it is important to check statistics when they are used in articles or textbooks.

20. Using statistics makes an idea less clear.

21. I often find it helpful to look at statistics when studying social studies.

22. Consumers could do a better job of shopping if they understood some basic statistical ideas.

23. Statistics are not mysterious.

24. Statistical ideas are not very useful in social studies.

25. Social studies as a subject is improved by including statistical ideas.

26. I don't see why we have to use statistics in social studies.

27. Having to use statistics is more trouble than its worth.

Part II. Statistical Knowledge

This is a test of your statistical knowledge. Like the first part of the QUESST Evaluation Instrument, it will also be machine scored.

Note that Part II begins with question number 41. Mark your answer for this question by darkening in the space over the letter which best answers that question. If you change your mind, erase the old answer completely. You may mark only one response for each question. Mark the answer which is most correct. Remeber, Part II of the test begins with question 41.

STATISTICAL KNOWLEDGE TEST

ENERGY ISSUES

41. Percentages are useful when looking at change because they tell us?

    (a) real numbers
    (b) abstract numbers
    (c) absolute change
    (d) raw numbers
    (e) proportions

42. In a city of 5,000 some 600 people are from Central and South America. The percentage of these people in the city is?

    (a) 8%
    (b) 10%
    (c) 12%
    (d) 15%
    (e) 20%

43. Gasoline use goes up with increases in leisure time. This is an example of:

    (a) random association
    (b) a negative correlation
    (c) a range or distribution
    (d) a positive correlation
    (e) a survey result

44. When average income increases, cases of serious illness tend to decrease. This is an example of:

    (a) random association
    (b) a negative correlation
    (c) a range or distribution
    (d) a positive correlation
    (e) a cause-effect relationship

Speeds and Weights of Selected Items

Tank (45 m.p.h.) 120,000 lbs.

Racing motorcycle (140 m.p.h.) 800 lbs.

A man walking (5 m.p.h.) 180 lbs.

A crawling worm (1/20 m.p.h.) 2 oz.

Jet fighter (2,300 m.p.h.) 20,000 lbs.

World War II fighter plane (400 m.p.h.) 10,000 lbs.

A thrown football (35 m.p.h.) 1 lb.

[illegible] If the items above were rank ordered by speed which one would be 3rd fastest?

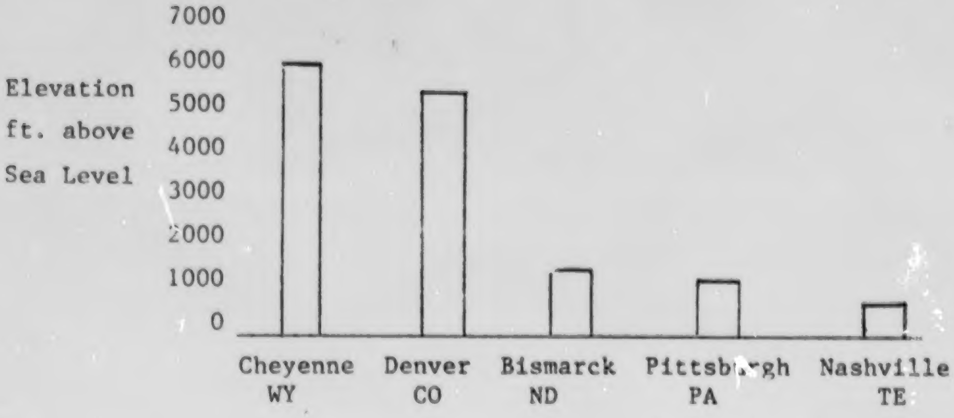
(a) racing motorcycle
(b) a walking man
(c) a football
(d) a jet fighter
(e) World War II fighter plane

46. If the items were rank ordered from heaviest to lightest, which would be the #2 item?

(a) tank
(b) World War II fighter plane
(c) jet fighter
(d) racing motorcycle
(e) a football

47. Which is the most accurate rank order of the following nations from most urban to least urban? Japan = 72% urban, South Korea = 41% urban, China = 23% urban, and Singapore = 100% urban.

(a)	(b)	(c)	(d)	(e)
Japan	South Korea	Singapore	China	Singapore
South Korea	Japan	Japan	Singapore	Japan
China	Singapore	South Korea	Japan	China
Singapore	China	China	South Korea	South Korea



48. The elevation of Bismarck appears to be about _____feet above sea level.

(a) 1000
(b) 1300
(c) 1800
(d) 2000
(e) 800

49. The elevation of Pittsburg appears to be about ______feet above sea level.

(a) 1000
(b) 1100
(c) 1500
(d) 1600
(e) 100

Questions 50 to 53 are based on the table below.

BEST COPY AVAILABLE

Vital Statistics, Health, and Nutrition

No. 67. EXPECTATION OF LIFE AND MORTALITY RATES, BY AGE, RACE, AND SEX: 1967

AGE (years)	EXPECTATION OF LIFE IN YEARS					MORTALITY RATE PER 1,000 LIVING AT SPECIFIED AGE				
	Total	White		Negro and other		Total	White		Negro and other	
		Male	Female	Male	Female		Male	Female	Male	Female
Under 1	70.5	67.8	75.1	61.1	68.2	22.39	22.32	16.82	39.20	32.39
1	71.1	68.3	75.3	62.6	69.5	1.35	1.25	1.05	2.54	2.13
2	70.2	67.4	74.4	61.8	68.6	0.87	0.85	0.70	1.54	1.21
3	69.2	66.5	73.5	60.9	67.7	0.66	0.70	0.51	1.09	0.80
4	68.3	65.5	72.5	59.9	66.8	0.57	0.60	0.45	0.90	0.72
5	67.3	64.6	71.5	59.0	65.8	0.60	0.71	0.42	1.08	0.64
6	66.4	63.6	70.6	58.1	64.9	0.49	0.55	0.37	0.79	0.54
7	65.4	62.7	69.6	57.1	63.9	0.40	0.42	0.33	0.58	0.45
8	64.4	61.7	68.6	56.1	62.9	0.33	0.33	0.29	0.45	0.39
9	63.4	60.7	67.6	55.2	62.0	0.29	0.28	0.25	0.39	0.36
10	62.4	59.7	66.7	54.2	61.0	0.28	0.28	0.24	0.40	0.34
11	61.5	58.7	65.7	53.2	60.0	0.30	0.33	0.24	0.48	0.35
12	60.5	57.8	64.7	52.2	59.0	0.37	0.44	0.26	0.61	0.39
13	59.5	56.8	63.7	51.3	58.0	0.47	0.60	0.30	0.79	0.44
14	58.5	55.8	62.7	50.3	57.1	0.61	0.80	0.37	1.02	0.51
15	57.6	54.9	61.7	49.4	56.1	0.77	1.03	0.44	1.29	0.60
16	56.6	53.9	60.8	48.4	55.1	0.93	1.26	0.52	1.58	0.70
17	55.7	53.0	59.8	47.5	54.2	1.08	1.45	0.57	1.88	0.80
18	54.7	52.1	58.8	46.6	53.2	1.15	1.59	0.60	2.18	0.90
19	53.8	51.1	57.9	45.7	52.3	1.21	1.68	0.61	2.48	1.00
20	52.9	50.2	56.9	44.8	51.3	1.27	1.77	0.61	2.80	1.12
21	51.9	49.3	55.9	43.9	50.4	1.33	1.85	0.62	3.11	1.24
22	51.0	48.4	55.0	43.1	49.4	1.37	1.88	0.63	3.38	1.35
23	50.1	47.5	54.0	42.2	48.5	1.37	1.86	0.64	3.58	1.45
24	49.1	46.6	53.0	41.4	47.6	1.36	1.79	0.65	3.73	1.53
25	48.2	45.7	52.1	40.5	46.6	1.35	1.70	0.65	3.87	1.61
26	47.3	44.7	51.1	39.7	45.7	1.34	1.62	0.67	4.02	1.71
27	46.3	43.8	50.1	38.8	44.8	1.34	1.57	0.69	4.19	1.85
28	45.4	42.9	49.2	38.0	43.9	1.38	1.56	0.72	4.39	2.05
29	44.4	41.9	48.2	37.1	43.0	1.44	1.59	0.76	4.62	2.28
30	43.5	41.0	47.2	36.3	42.1	1.50	1.63	0.81	4.87	2.54
31	42.6	40.1	46.3	35.5	41.2	1.58	1.68	0.86	5.13	2.80
32	41.6	39.1	45.3	34.7	40.3	1.68	1.76	0.93	5.40	3.06
33	40.7	38.2	44.4	33.9	39.4	1.79	1.87	1.02	5.67	3.31
34	39.8	37.3	43.4	33.0	38.5	1.93	2.02	1.12	5.95	3.55
35	38.9	36.4	42.5	32.2	37.7	2.09	2.20	1.24	6.25	3.80
36	37.9	35.4	41.5	31.4	36.8	2.27	2.40	1.36	6.58	4.08
37	37.0	34.5	40.6	30.6	36.0	2.45	2.62	1.49	6.98	4.35
38	36.1	33.6	39.6	29.9	35.1	2.65	2.85	1.63	7.47	4.62
39	35.2	32.7	38.7	29.1	34.3	2.86	3.09	1.77	8.04	4.90
40	34.3	31.8	37.8	28.3	33.4	3.10	3.37	1.94	8.68	5.19
41	33.4	30.9	36.8	27.6	32.6	3.36	3.69	2.11	9.33	5.50
42	32.5	30.0	35.9	26.8	31.8	3.66	4.06	2.31	9.96	5.87
43	31.6	29.1	35.0	26.1	31.0	4.00	4.49	2.54	10.53	6.29
44	30.8	28.3	34.1	25.3	30.2	4.37	4.98	2.79	11.07	6.77
45	29.9	27.4	33.2	24.6	29.4	4.78	5.52	3.07	11.62	7.29
46	29.0	26.6	32.3	23.9	28.6	5.23	6.12	3.37	12.26	7.84
47	28.2	25.7	31.4	23.2	27.8	5.72	6.77	3.67	13.04	8.41
48	27.3	24.9	30.5	22.5	27.0	6.26	7.50	3.99	14.02	8.99
49	26.5	24.1	29.6	21.8	26.3	6.84	8.29	4.32	15.16	9.60
50	25.7	23.3	28.7	21.1	25.5	7.47	9.14	4.67	16.38	10.25
51	24.9	22.5	27.9	20.5	24.8	8.11	10.07	5.05	17.64	10.96
52	24.1	21.7	27.0	19.8	24.0	8.89	11.09	5.47	19.00	11.77
53	23.3	20.9	26.2	19.2	23.3	9.71	12.23	5.93	20.46	12.67
54	22.5	20.2	25.3	18.6	22.6	10.59	13.49	6.42	22.00	13.69
55	21.8	19.5	24.5	18.0	21.9	11.56	14.82	6.98	23.74	14.84
56	21.0	18.8	23.6	17.4	21.2	12.58	16.24	7.58	25.50	16.07
57	20.3	18.1	22.8	16.9	20.6	13.65	17.76	8.20	27.20	17.27
58	19.5	17.4	22.0	16.3	19.9	14.75	19.38	8.82	28.51	18.40
59	18.8	16.7	21.2	15.8	19.3	15.90	21.11	9.48	29.64	19.53
60	18.1	16.1	20.4	15.3	18.7	17.12	22.96	10.19	30.54	20.52
61	17.4	15.4	19.6	14.7	18.1	18.34	24.93	11.01	31.69	21.69
62	16.7	14.8	18.8	14.2	17.5	20.04	26.98	12.00	33.74	23.60
63	16.1	14.2	18.0	13.7	16.9	21.66	29.10	13.21	37.13	26.56
64	15.4	13.6	17.3	13.2	16.3	23.58	31.32	14.62	41.64	30.33
65	14.8	13.0	16.5	12.7	15.8	25.62	33.61	16.17	46.85	34.69
66	14.2	12.5	15.8	12.3	15.4	27.79	36.07	17.84	52.10	38.95
67	13.5	11.9	15.1	12.0	15.0	30.16	38.93	19.71	57.06	42.40
68	13.0	11.4	14.3	11.7	14.6	32.76	42.34	21.81	61.22	44.39
69	12.4	10.9	13.7	11.4	14.3	35.20	46.21	24.13	64.63	45.13

Source: Dept. of Health, Education, and Welfare, Public Health Service; annual report, *Vital Statistics of the United States*.

50. If you were a black male aged 21 in 1967, how many years could you expect to live?

(a) 51.9
(b) 43.9
(c) 49.3
(d) 50.2
(e) 55.9

51. How many white males aged 67 die per 1000?

(a) 30.16
(b) 38.93
(c) 19.71
(d) 52.10
(e) 57.06

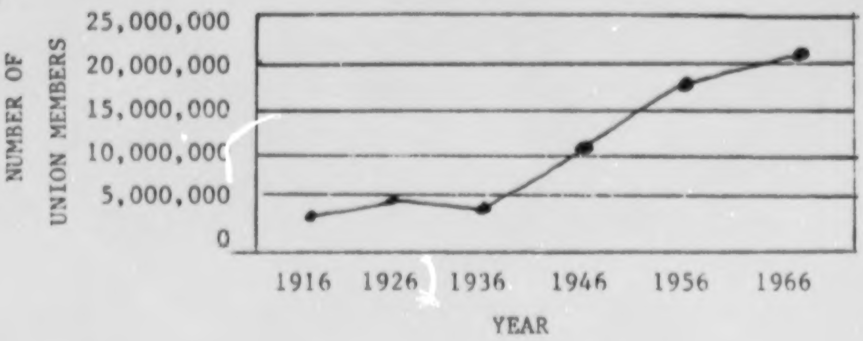
52. How many black females aged 67 die per 1000?

(a) 15.1
(b) 12.0
(c) 30.6
(d) 19.71
(e) 42.40

53. If you were a white female and had a life expectancy of 28.7 years in 1967, how old were you?

(a) 23.3
(b) 28.7
(c) 50.0
(d) 39.0
(e) 44.0

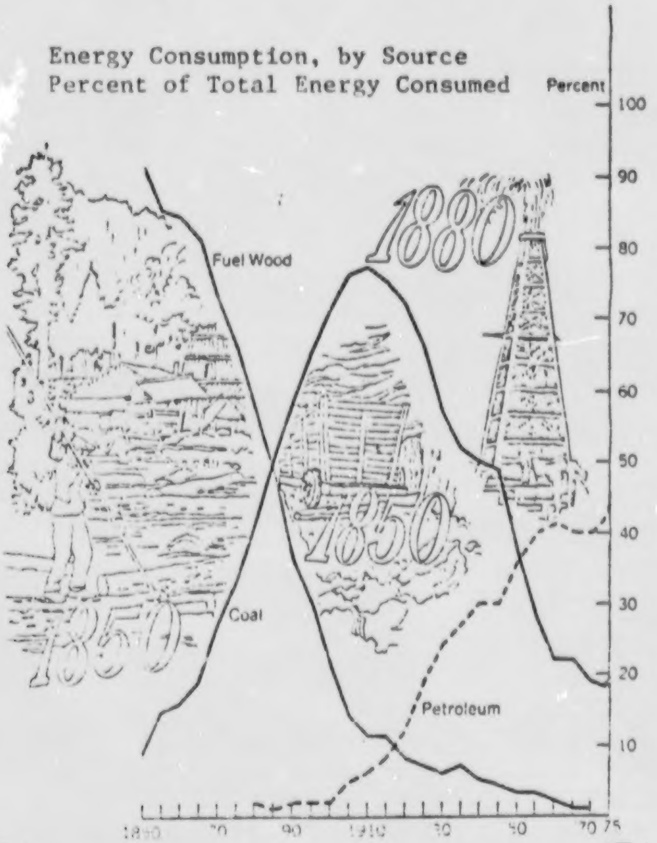
LABOR UNION MEMBERSHIP



54. According to the graph above, what was the union membership in 1926?

(a) 2,000,000
(b) 3,500,000
(c) 4,990,000
(d) **5,500,000**
(e) 4,800,000

Questions 55 through 58 refer to the graph below.


Energy Consumption, by Source
Percent of Total Energy Consumed

55. At its peak, coal comprised what percent of total energy consumed?

(a) 19%
(b) 50%
(c) 8%
(d) 78%
(e) 95%

56. In what year did coal and fuel wood each comprise approximately 50% of the energy consumed in the U.S.?

(a) 1850
(b) 1885
(c) 1917
(d) 1950
(e) 1970

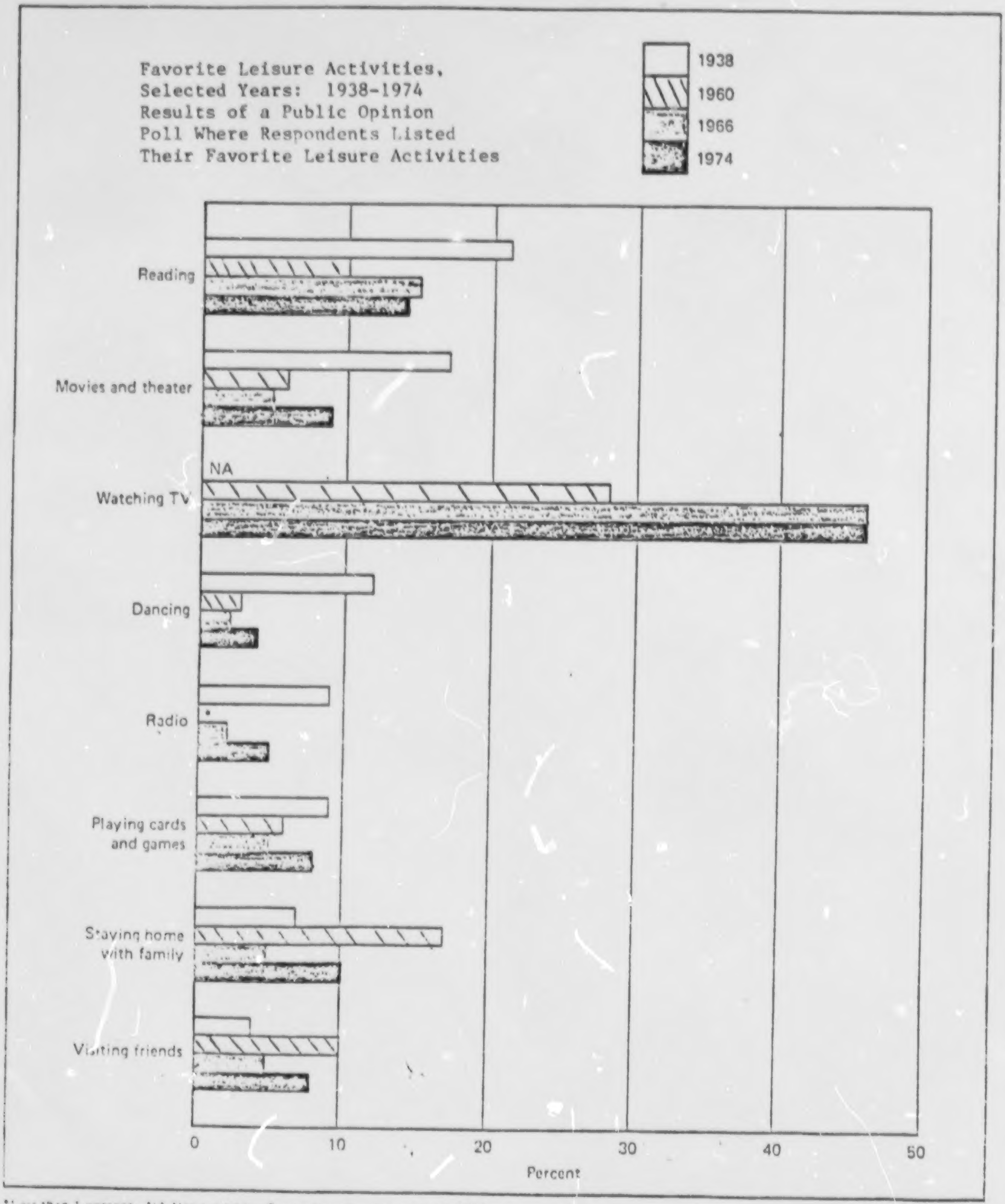
57. The point of intersection of two lines on this graph means:

(a) that those two energy sources both comprised half of the total energy consumed in the U.S.
(b) that each of those two energy sources have reached their peak in terms of the percent of total energy consumed
(c) that each of those two energy sources comprised the same percent of total energy consumed in the U.S. that year
(d) the total amount of coal and fuel wood consumed that year was the same
(e) that America dramatically changed its consumption practices that year

58. This graph indicates that:

(a) twice as much petroleum was being used as coal in 1975
(b) petroleum has not always been a major source of energy in the U.S.
(c) less coal was burned in 1945 than in 1930
(d) the proportion of total energy consumed by fuel wood has generally declined since 1850
(e) all of these

Questions 59 through 63 refer to the graph below.



*Less than 1 percent. NA Not available. See technical notes and table 10/4.

Source: The Gallup Opinion Index, report No. 5, March 1974. Copyright by the American Institute of Public Opinion. Graph published in Social Indicators 1976, Bureau of Census, p. 492.

59. According to this graph, which leisure activity is by far the most popular among Americans?

(a) reading

(b) movies and theater

(c) watching TV

(d) dancing

(e) radio

60. What percent of the people surveyed in 1938 rated reading a favorite leisure activity?

(a) 43%

(b) 21%

(c) 10%

(d) 18%

(e) 52%

61. In what year did "movies and theater" receive their lowest rating?

(a) 1938

(b) 1960

(c) 1966

(d) 1974

62. Excluding "Watching TV", what activity received the highest rating from Americans in 1960?

(a) reading

(b) movies and theater

(c) dancing

(d) radio

(e) staying home with family

63. Which of the following activities received a higher rating in 1960 than in 1938?

(a) reading

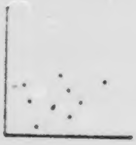
(b) movies and theater

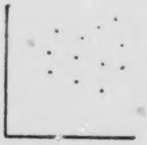
(c) playing cards

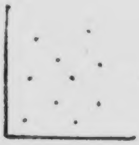
(d) dancing

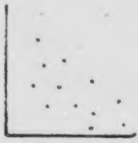
(e) visiting friends

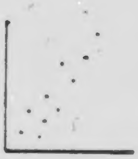
64. Which of the correlations illustrated on the scatter diagrams below is strongest?

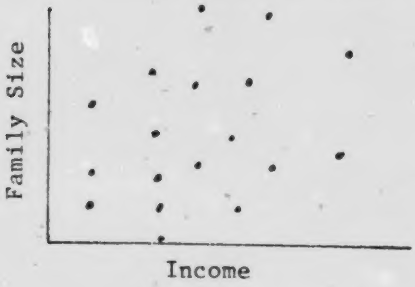
(a) 

(b) 

(c) 

(d) 

(e) 


Families and Their Income

65. What do the dots represent in the scatter diagram "Families and Their Income"?

(a) family earning potential

(b) money earned by each family member

(c) specific families

(d) what families should earn

(e) all of the above

AMERICAN FAMILY AND CONSUMER ISSUES

QUESST EVALUATION INSTRUMENT FOR PILOT TESTING

Part I: Attitude Survey

The purpose of this questionnaire is to help us to understand how you feel about the use of statistical ideas in social studies. We want your honest answer to each of the statements below. Read each statement and decide if you strongly agree, agree, disagree, strongly disagree, or are undecided. Mark your answer on the standard answer sheet provided. Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

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YOU HAVE ONLY 10 MINUTES TO COMPLETE THIS PART SO WORK RAPIDLY.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

1. Using statistics is fun.
2. I feel comfortable using statistics.
3. I usually skip over statistics when they appear in a reading.
4. Using statistics makes it difficult to answer social studies questions.
5. I usually hate it when people support their arguments with a lot of statistics.
6. I usually find statistics confusing.
7. America's citizens need more knowledge of how to interpret statistics.
8. Statistics as a school subject is boring.
9. Statistical concepts like mean, median, and percent are important to understanding social studies issues.
10. I often read material which could have been improved by including more statistics.
11. Most social issues and problems can be better understood when we look carefully at accurate statistics.
12. Statistics help me to understand subject matter better.
13. More people should learn how to use statistics.
14. Social studies is less interesting when you use statistical ideas.
15. A knowledge of statistics really doesn't help most people.

Use this key when marking your answers:

(A) = Strongly Agree
(B) = Agree
(C) = Undecided
(D) = Disagree
(E) = Strongly Disagree

16. Being able to understand statistics is important to learning social studies.

17. Using statistics is really hard for me.

18. I am suspicious of people's arguments if they cannot be supported with statistics.

19. I think it is important to check statistics when they are used in articles or textbooks.

20. Using statistics makes an idea less clear.

21. I often find it helpful to look at statistics when studying social studies.

22. Consumers could do a better job of shopping if they understood some basic statistical ideas.

23. Statistics are not mysterious.

24. Statistical ideas are not very useful in social studies.

25. Social studies as a subject is improved by including statistical ideas.

26. I don't see why we have to use statistics in social studies.

27. Having to use statistics is more trouble than its worth.

Part II. Statistical Knowledge

This is a test of your statistical knowledge. Like the first part of the QUESST Evaluation Instrument, it will also be machine scored.

Note that Part II begins with question number 41. Mark your answer for this question by darkening in the space over the letter which best answers that question. If you change your mind, erase the old answer completely. You may mark only one response for each question. Mark the answer which is most correct. Remeber, Part II of the test begins with question 41.

STATISTICAL KNOWLEDGE TEST

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AMERICAN FAMILY AND CONSUMER ISSUES

41. Which of the following is the least effective way of identifying a representative sample of a town's population?

(a) drawing names from a hat

(b) selecting one person for each city block

(c) picking only people whose first names are John or Mary

(d) picking five names from each page of the phone directory

(e) picking every 3rd name off the utility bill list

42. Which of the following is an example of a stratified sample of a school's population?

(a) all seventh graders were selected

(b) 10% of seventh graders were selected

(c) 10% of students in each grade were selected

(d) all student names were put in a box, and 20% were selected

(e) 50% of the students were selected

43. Which of the following is true about using samples?

(a) information is more difficult to collect

(b) different kinds of samples give the same estimated values

(c) it takes more time than studying the entire population

(d) it is the only practical way of getting some kinds of information

(e) the degree to which a sample accurately represents the population is never known

44. The Dr. Johnson Aspirin Company did a survey to find out what kinds of people in the U.S. used their product. They surveyed 750 people from large cities, 150 people from small towns, and 100 people from rural places. This is an example of:

(a) stratified sampling

(b) random sampling

(c) systematic sampling

(d) interviewing a population

(e) scientific sampling

45. What is the major weakness of the mean?

(a) it is not a good measure of average
(b) it is unreliable
(c) it is not a real number
(d) it is hard to calculate
(e) it is affected by extreme scores

46. If five people have incomes of $8,500; $9,000; $9,750; $11,200; and $13,500; the median income is?

(a) $9,000
(b) $9,750
(c) $9,500
(d) $10,000
(e) $10,250

47. Which measure of average is best to use when the data has extremely high or low scores?

(a) mean
(b) center
(c) median
(d) control tendency
(e) mode

48. Which measure of average is a point above which are half of the scores and below which are the other half of the scores?

(a) mean
(b) median
(c) mode
(d) range
(e) control tendency

49. Which measure of average is an arithmetic average?

(a) mode
(b) median
(c) control tendency
(d) range
(e) mean

50. Which measure of average is most influenced by extreme scores?

(a) center
(b) mode
(c) central tendency
(d) median
(e) mean

51. The range of a distribution of numbers is:

(a) the difference between the highest score and lowest score
(b) the size of the average
(c) the number of cases being studied
(d) the percent of cases over the average
(e) the absolute number of cases on either side of the median

52. The range in annual population growth rates for countries of the Middle East is 2.9%. The smallest growth rate of any country in the region is 0.8%. What is the highest growth rate?

(a) 0.8
(b) 3.7
(c) 2.9
(d) 2.1
(e) 2.5

53. Joe Smith is a teacher and has earned salaries of \$12,000, \$12,750, \$13,450, \$14,250, and \$15,000 in each of the past five years. The range in his salary during that period is:

(a) \$12,000
(b) \$15,000
(c) \$13,450
(d) \$3,000
(e) \$1,500

54. Gasoline use goes up with increases in leisure time. This is an example of:

(a) random association
(b) a negative correlation
(c) a range or distribution
(d) a positive correlation
(e) a survey result

55. When average income increases, cases of serious illness tend to decrease. This is an example of:

(a) random association

(b) a negative correlation

(c) a range or distribution

(d) a positive correlation

(e) a cause-effect relationship

Questions 56 through 58 are based on the table below.

FAMILY INCOME BY EDUCATION AND RACE

RACE OF FAMILY HEAD AND TYPE OF SCHOOL COMPLETED	MEDIAN INCOME	
	1961	1968
WHITE FAMILIES	$6100	$9179
Elementary School	4419	6328
High School (4 years)	6548	9680
College (4 or more years)	9503	13,589
BLACK AND OTHER FAMILIES	$3340	$5684
Elementary School	2593	4297
High School (4 years)	4773	7057
College (4 or more years)		12,472

*Less than 200,000 persons in this category. Therefore, the data is not reported in the Statistical Abstract of the U.S., 1977, p. 325.

56. What was the median income in 1968 of white families whose head completed four years of high school?

(a) $6100

(b) $9179

(c) $6328

(d) $13,589

(e) $9680

57. The fairest method of comparing the income increase from 1961 to 1968 among the various groups on this chart is to use:

(a) the mean increase for each group

(b) the median increase for each group

(c) the differences (substract 1961 income from 1968 income)

(d) the range for each group

(e) the percentage change for each group

58. In which of the following categories are the incomes between whites and blacks the closest?

(a) elementary school in 1961

(b) elementary school in 1968

(c) high school in 1961

(d) college in 1968

(e) high school in 1968

59. A conclusion one can reasonably draw from this table is that:

(a) the U.S. experienced a period of inflation between 1961 and 1968.

(b) the average income of white families was higher than that of black and other families in both 1961 and 1968.

(c) the incomes of all three education levels of white families increased more than the incomes of the corresponding black and other families.

(d) the civil rights movement of the 1960's had a significant effect on average incomes of black families.

(e) all of the above.

Team X		Team Y		Team Z	
Players 1	$100,000	Player 1	$120,000	Player 1	$80,000
Player 2	60,000	Player 2	100,000	Player 2	60,000
Player 3	55,000	Player 3	85,000	Player 3	40,000
Player 4	50,000	Player 4	75,000	Player 4	15,000
Player 5	40,000	Player 5	75,000		
		Player 6	70,000		
TOTAL	$305,000	TOTAL	$525,000	TOTAL	$195,000

60. What is the mean income for Team X?

(a) $61,000
(b) $55,000
(c) $52,500
(d) $80,000
(e) $48,000

Speeds and Weights of Selected Items

Tank (45 m.p.h.) 120,000 lbs.
Racing motorcycle (140 m.p.h.) 800 lbs.
A man walking (5 m.p.h.) 180 lbs.
A crawling worm (1/20 m.p.h.) 2 oz.
Jet fighter (2,300 m.p.h.) 20,000 lbs.
World War II fighter plane (400 m.p.h.) .10,000 lbs.
A thrown football (35 m.p.h.) 1 lb.

61. If the items above were rank ordered by speed which one would be 3rd fastest?

(a) racing motorcycle
(b) a walking man
(c) a football
(d) a jet fighter
(e) World War II fighter plane

62. If the items were rank ordered from heaviest to lightest, which would be the #2 item?

(a) tank

(b) World War II fighter plane

(c) jet fighter

(d) racing motorcycle

(e) a football

DOLLARS SPENT ON MUNICIPAL SERVICES

	1950	1975
Police & Fire	$1,000	$1,500
Roads	1,000	1,600
Schools	4,010	6,000
Water	500	1,500
Insurance	100	200

63. In the table above, which of the services had the largest percentage increase in spending?

(a) police & fire

(b) schools

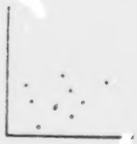
(c) road maintenance

(d) water treatment

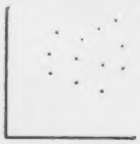
(e) insurance

64. Which of the correlations illustrated on the scatter diagrams below is strongest?

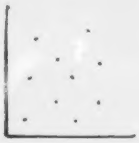
(a)



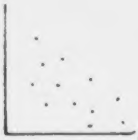
(b)



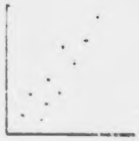
(c)

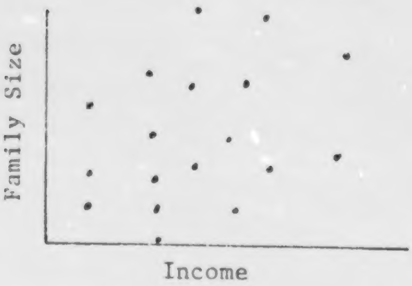


(d)



(e)





Families and Their Income

65. What do the dots represent in the scatter diagram "Families and Their Income"?

(a) family earning potential

(b) money earned by each family member

(c) specific families

(d) what families should earn

(e) all of the above

ATTACHMENT #21

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STUDENT FEEDBACK FOR QUESST

Teacher ______________________ Course ______________ Grade ___________

1. Check the math classes which you have taken or are now taking?

___ Consumer Math

___ General Math

___ Business Math

___ Algebra I

___ Trigonometry

___ Computer Math

___ Statistics

___ Geometry

___ Algebra II

___ Calculus

___ Other, Please Specify

____

____

____

____

2. How well do you usually do in math classes?

___ Very Well ___ Average ___ Poorly

3. How well do you usually like math classes?

___ Very Well ___ OK ___ Not at all

4. Which QUESST activity(ies) or lessons did you like the best? Why?

____

____

____

____

5. Which did you like the least? Why?

____

____

____

____

6. In general, what did you like the most about these materials and activities?

____

____

____

____

7. Did the materials raise any important or interesting questions? If so, what were they?

____

____

____

____

ATTACHMENT #22

TEACHER FEEDBACK FORM

TEACHER FEEDBACK FOR QUESST

Instructions: All questions apply to the entire module cluster with which you worked. In the comments spaces after each question please note any significant variation among modules.

1. In general, how easy were these materials to teach?

   Very Easy 5 4 3 2 1 Very Difficult

   a. To what extent, were teacher directions clear?

      Very Clear 5 4 3 2 1 Confusing

   Comments:

   b. To what extent were the student materials understandable?

      Very Understandable 5 4 3 2 1 Confusing

   Comments:

   c. To what extent did the student materials generate interest in the topic?

      Very High Interest 5 4 3 2 1 Boring

   Comments:

   d. To what extent did the teacher materials provide content background on the topic?

      Just Right 5 4 3 2 1 Not Enough

   Comments:

e. To what extent did the teacher materials provide background on the quantitative ideas?

Just Right 5 4 3 2 1 Not Enough

Comments: ____

____

____

f. Were there any logistical problems with using the materials? If so, please specify:

____

____

____

____

2. Was enough variety provided in the activities within the cluster of modules you used?

Plenty of Variety 5 4 3 2 1 Not Enough Variety

3. How well did the materials fit into the ongoing curriculum in your school?

Very Well 5 4 3 2 1 Not at All

Comments: ____

____

____

4. How important were the questions and issues raised by the modules?

Very Important 5 4 3 2 1 Not At All Important

Comments: ____

____

____

5. Have these materials changed your ideas about using quantitative ideas or techniques in your classes? If so, in what ways? If not, why not?

6. Which of the modules you used worked best? Why?

7. What suggestions do you have for revising these materials? Please indicate whether the grade level and estimated times were appropriate for each module you used. If not, please specify discrepencies?

SED-77-18598

ATTACHMENT #23

CLASSROOM OBSERVATION SCHEDULE

OBSERVATION SCHEDULE

Observer's Name: ______________________________ Date: ______________

Teacher's ID Number: ____

Module and Lesson being taught: ____________________________________

Period/time of day: ____

CLASSROOM CLIMATE:

1. Seating Pattern: Rows Circle Semicircle At Group Tables

   Other (describe): ____

2. General attentiveness: Estimate the percent of students who seem to be following what is going on: ______________________________________.

   (specify here)

3. General Interest: How interested did the students seem to be?

   VERY INTERESTED 5 4 3 2 1 NOT INTERESTED AT ALL

   Support judgement with specific example(s): _______________________

   ____

   ____.

4. Discipline: Are there any detectable discipline problems?

   _______ YES _______ NO If yes, what kind, how often and how severe?

   ____

   ____

   ____.

5. Absenteeism: How many students are present? _______________________.

   How many students are supposed to be in class? ____________________.

6. Language: Are there any expressions being used which could be taken to indicate a lack of sensitivity or poor attitude toward the key content being studied? _______ YES _______ NO If yes, describe:

   ____

____

____.

7. Distractions: Are there any distractions?

_________ YES __________ NO If yes, describe: ______________

____

____.

TEACHER BEHAVIOR:

1. Is the teacher responsive to questions? YES 5 4 3 2 1 NO

2. Does the teacher give praise when due? YES 5 4 3 2 1 NO

3. Does the teacher give constructive criticism? YES 5 4 3 2 1 NO

4. Rate the teacher's performance on the observed activity(ies) from excellent to poor. EXCELLENT 5 4 3 2 1 POOR Support your judgement with a couple of statements that specifically describe what you saw that was good or bad: ____

____

____

____.

OTHER CONCERNS:

1. Are all necessary (specified) materials made available to the students?

________ YES _________ NO

2. Are the student materials clearly legible? ________ YES ________ NO

3. Did the teacher seem to be following the prescribed lesson activities?

________ YES ________ NO If NO, describe deviations: ___________

____

____

____.

ATTACHMENT #24

FIELD TEST ANALYSIS: CLUSTER REPORTS

ATTACHMENT #24

Fieldtest Analysis: Cluster Reports

Cluster One:

Cluster one of the QUESST modules was termed "World Nations A". It consisted of the three modules entitled "Comparing Nations: Health and Wealth Around the World;" "Nations: Where Do People Live;" and "Around the Globe: Freedom and the Quality of Life." Two field test teachers with a total of 121 seventh grade students completed both the knowledge and attitude tests for cluster one. Knowledge test results are presented first followed by attitude test results.

Knowledge Test Results:

Cluster one knowledge test results were processed through the RELIABILITY subprogram of SPSS to obtain an estimate of the 25-item knowledge test's reliability. An estimate of the reliability (Chronbach's alpha) of the combined experimental and control group scores was $\alpha = .53$ for the pretest and $\alpha = .74$ for the posttest.

The analysis of covariance results indicated that the posttest scores were significantly affected by differences in the covariate (the pretest scores), experimental versus control group membership (the treatment effect) and teacher/class characteristics. In addition, there was a significant 2-way group by teacher interaction effect. Table 4 below displays the F ratios, the degrees of freedom and the associated probabilities for these effects.

Table 4.

Cluster One Knowledge Test Analysis of Covariance Results

Factor	F Ratio	Degrees of Freedom	Significance
Covariate	84.88	1,113	$p < .001$
Group	48.43	1,113	$p < .001$
Teacher/ Class	15.42	1,113	$p < .001$
Group By Teacher	36.11	1,113	$p < .001$

The Multiple Classification Analysis (MCA) table produced by SPSS in conjunction with an analysis of covariance indicated that differences in the adjusted posttest group means between the experimental and control group were almost 14.5 points (the standard deviation was 16.8) and that differences between the two teachers' classes were 8.24 points. Differences between the performance of males and females were only 1.19 points, a conclusion which is consistent with an insignificant F ratio in the analysis of covariance.

Table 5. below displays the results of the nonparametric tests conducted to determine whether significant pretest-to posttest growth occurred in either the experimental or the control group.

Table 5.

Cluster One Knowledge Test: Nonparametric Gain Score Contrasts [1]

Teacher	Group	Number of Increases	Cases Showing Decreases	Z Value	Significance [2]
01	Exp. (n=51)[a]	26 (28.9)[b]	18(13.3)	-2.98	$p<.003$
	Ctrl.(n=23)	12(9.6)	6(9.3)	-1.31	$p<.191$ n.s.
02	Exp. (n=22)	21(11.0)	0(0.0)	-4.01	$p<.001$
	Ctrl.(n=25)	6(13.6)	16(10.7)	-1.46	$p<.144$ n.s.
Combined					
	Exp. (n=73)	47(40.5)	18(13.3)	-5.44	p .001
	Ctrl.(n=48)	18(20.9)	22(20.2)	-0.46	p .643 n.s.

1. These are Wilcoxon's Matched-Paris Signed-ranks test.
2. These are two tailed probabilities.
a. These n's include cases showing no change.
b. These numbers are means of ranks.

As may be seen in Table 5, the experimental groups of both teachers showed significant gains while their control group counterparts failed to show any gains. The means of the ranks for these gains over those for the cases showing decreases in scores contribute to the reported levels of significance. These results strongly support the conclusion that significant knowledge learning took place as a result of instruction with the cluster one modules.

Table 6. presents the results of tests conducted to determing whether these gains were large enough to be exposed in differences in the central tendency of the posttest scores of the experimental and control groups.

Table 6.

Cluster One Knowledge Test: Nonparametric[1] Contrasts
Experimental and Control Group Posttest Scores

Teacher	Mean Rank Ctrl. Group	Mean Rank Exp. Group	Z value	Significance[2]
01	31.2 (n=23)	40.3 (n=51)	-1.70	$p < .090$ n.s.
02	13.7 (n=25)	35.7 (n=22)	-5.50	$p < .001$
Combined	42.5 (n=48)	73.2 (n=73)	-4.73	$p < .001$

1. These are Mann-Whitney U (Wilcoxon Rank Sum) Tests.
2. These are two-tailed probabilities.

Table 6. shows that the contrast for teacher two was significant, while the contrast for teacher one fails to show a significant result. The combined test attains significance at $p < .001$. These results support the conclusion that experimental group's scores were significantly larger than those of the control group.

1. An arbitrary significance level of $p < .01$ was adopted for this study.

Teachers using these materials felt that they were easy to teach, and that the directions for the teacher were clear. While the materials generated only moderate interest, in the judgment of most teachers, they seemed to fit well into the ongoing course of study. Comments from the teachers about their experience using these modules included: "The materials fit the way I like to teach." "The pretest and posttest were too hard for 7-9. They were for 10-12 as stated." "Our Food and Population curriculum touch many of these areas; therefore our interest was already high." "I found them easily adapted to 7th grade, even when set up for 9-12. The only revisions I can suggest are those I discussed during the interview."

Student comments were varied. Responding to "Which QUESST activities or lessons did you like the best? Why?", students said such things as:

"I liked the food and population activity because it was teaching me things about other people."

"I'm not sure which ones I liked the best."

"The ones that you check which country is the poorest and which is the richest and things like that."

"When we studied and discussed about the different cities (rural and suburban cities) because it was very interesting."

The same students responses to the question "What did you like least? Why? said such things as:

"Some of the statistics because I didn't understand some."

"The one that deals with the urban and suburban".

"The one's were you have to read alot, because I think you learn more talking to the teacher and doing activities (in QUESST)."

"When we took the test on statistics. Well, for one thing it wasn't very interesting subject."

"I don't like to do the packets because I don't get a good grade on them."

Cluster One Conclusion:

The preponderance of evidence indicates that instruction with the Cluster One modules of Project QUESST had a substantial impact on students' knowledge of quantitative (statistical) concepts. Available evidence indicates a lack of any attitude impact.

Cluster Two

Cluster two of the QUESST mdoules was termed "World Nations B," and consisted of the modules entitled: "World Population: Growing, Growing, Gone," "Global Interdependence," and "Nations: Guns or Butter?" Five teachers and a total of 259 eight through twelfth graders completed the necessary attitude and knowledge test data for this cluster. Knowledge test data are presented first, followed by attitude test data and comments of students and teachers.

Knowledge Test Results:

The 25-item knowledge test for cluster two was shown to have a reliability (Chronbach's alpha) of $\alpha=.77$ for the pretest and $\alpha=.80$ for the posttest. Both of these reliabilities were calculated on the combined experimental and control group scores.

The analysis of covariance results indicated that the posttest scores were significantly affected by the covariate (the pretest scores), experimental versus control group membership, and teacher/class characteristics.

No other factor main effects (i.g. sex or grade level) or two-way interactions attained significance. Table 7. below displays the F ratios, the degrees of freedom and the associated probabilities for these effects.

Table 7.

Cluster Two Knowledge Test Analysis of Covariance Results

Factor	F Ratio	Degrees of Freedom	Significance
Covariate	251.75	1,239	$p<.001$
Group	8.53	2,239	$p<.001$
Teacher/, Class	3.43	4,239	$p<.010$

The MCA table produced by SPSS as a part of the analysis of covariance procedure revealed that differences in the adjusted posttest group means between the experimental and control group was 7.41 points (the standard deviation was 18.1) and that differences among the teachers were as large as 9.29 points.

Table 8. displays the results of the nonparametric tests conducted to determine whether significant pretest to posttest growth occurred in either the experimental or control groups.

Table 8. shows that six of the **seven** expermental groups showed significant pretest to posttest gain in statistical knowledge. Only one of the control groups experienced a significant gain, a fact that could be explained by contamination since all control groups were selected from the same schools as experimental groups, and in some cases were even instructed by the same teacher who was administering the treatment to the experimental group. This weakness in the design is perhaps also reflected in the combined results which indicated that both the experimental and control groups experienced significant positive gains in statistical knowledge during the period of instruction. Nevertheless, the results of the nonparametric tests show a much stronger and more consistent result, that, when paired with the evidence which resulted from the analysis of covariance could be interpreted as being supportive of a conclusion that the cluster two modules had a positive impact on student user's knowledge of quantitative concepts. This conclusion may be examined further by contrasting the posttest scores of the experimental and control groups.

Table 8.

Cluster Two Knowledge Test: Nonparametric[1] Gain Score Contrasts

Teacher	Group	Number of Increases	Number of Decreases	Z Value	Significance[2]
01	Exp (n=28)[a]	22(13.2)[b]	4(15.4)	-2.89	$p < .004$
	Ctrl (n=22)	10(11.1)	10(9.8)	-0.24	$p < .808$ n.s.
02	Exp (n=33)	26(18.6)	5(7.3)	-4.12	$p < .001$
	Ctrl (n=15)	11(8.5)	3(3.7)	-2.61	$p < .009$
03	Exp (n=24)	22(11.5)	0(0.0)	-4.11	$p < .001$
	Ctrl (n=22)	12(11.0)	6(6.4)	-2.05	$p < .041$ n.s.
04	Exp 1(n=24)	19(11.4)	3(12.0)	-2.94	$p < .003$
	Exp 2(n=20)	16(9.9)	2(6.0)	-3.20	$p < .001$
	Ctrl (n=9)	7(6.0)	2(1.5)	-2.31	$p < .021$ n.s.
05	Exp 1(n=16)	11(8.5)	3(4.0)	-2.54	$p < .011$
	Exp 2(n=24)	14(11.2)	7(10.6)	-1.49	$p < 149$ n.s.
	Ctrl (n=22)	15(10.8)	5(9.6)	-2.13	$p < .033$ n.s.
Combined					
	Exp (n=169)	130(81.6)	25(59.1)	-8.16	$p < .001$
	Ctrl(n=90)	55(45.7)	26(31.0)	-4.02	$p < .001$

---

1. These are Wilcoxon's Matched-Pairs Signed- Ranks tests.
2. These are two-tailed probabilities.

a. These n's include cases showing no change.
b. These numbers are means of ranks

Table 9. displays the nonparametric tests used to contrast the postest performance of both groups.

Table 9.

Cluster Two Knowledge Test: Nonparametric[1] Contrasts of Experimental and Control Group Posttest Scores

Teacher	Mean Rank Ctrl. Group	Mean Rank Exp. Group	Z value	Significance[2]
01	20.9 (n=22)	29.1 (n=28)	-1.97	$p < .049$ n.s.
02	16.4 (n=15)	28.2 (n=33)	-2.71	$p < .007$
03	15.4 (n=22)	30.9 (n=24)	-3.93	$p < .001$
04	16.7 (n=9)	17.1(Exp 1) (n=24)	-0.10	$p < .919$ n.s.
	14.4 (n=9)	15.3(Exp 2) (n=20)	-0.26	$p < .795$ n.s.
05	16.4 (n=22)	23.8(Exp 1) (n=16)	-2.05	$p < .040$ n.s.
	21.9 (n=22)	25.0 (Exp 2) (n=24)	-0.79	$p < .427$ n.s.
Combined	96.9 (n=90)	147.6 (n=169)	-5.20	p .001

---

1. These are Mann-Whitney U (Wilcoxon Rank Sum) Tests.
2. These are two-tailed probabilities.

Table 9. shows that two of the seven contrasts performed at the level of the teacher/class attained significance beyond the $p < .01$ level specified for this field test. Nevertheless, the overall contrast of the combined experimental and control groups attained significance at $p < .001$. This result provides additional support for the conclusion that there was a knowledge treatment effect for cluster two.

Attitude Test Results

Cluster two attitude test results were shown to have a reliability (Chronbach's alpha) of $\alpha = .88$ for the pretest and $\alpha = .90$ for the posttest. Both of these reliabilities were calculated on the combined experimental and control group scores.

An analysis of covariance indicated that only the covariate (the pretest attitude scores) accounted for significant variation in the posttest scores. The statistics associated with this finding are: $F=239.23$ df 1,239 $p<.001$. No other factor main effects or two-way interactions attained signifcance. Consistent with this finding is the fact that none of the non-parametric gain score or experimental versus control group comparisons attained significance. Due to this set of circumstances, the tabled data for the cluster two attitude test is omitted. Teacher and Student comments solicited on the open-ended feedback forms follow:

Teacher and Student Comments:

Asked which activity or lesson they like best students replied:

"None because they were boring it didn't teach anything we didn't already know. It was just time consuming."

"Military statistics etc."

"Don't remember."

"English and P.E."

"Guns and Better because I know how powerful other countries are."

"I really didn't really have one that I liked the best because they were all similar. But I guess that I liked the populations one where you had so many people stand on one side."

Asked which activity or lesson they liked least, a sample of the students replied:

"The guns and butter, to much writing."

"The one with the population growth. It was boring and (I) didn't know what we were doing."

"Diagrams, positive and negative correlation."

"I don't remember."

Teachers using the modules generally felt that the teacher directions were clear, that the materials were moderately easy to teach, and that they fit well into the ongoing curriculum. Teachers made such comments as:

"They (the students) resisted them but with patience almost all were able to understand."

"Too many similarities, one to the next."

"They were good (the directions for teachers)."

"I will use your technique of teaching scatter diagrams."

"Our topic of study is India--it fit in pretty well."

Cluster Two Conslusion:

Evidence indicates that cluster two QUESST modules had a significant impact on students' knowledge of statistics as measured by our 25-item test. There was some evidence which could support a hypothesis of contamination or events in contemporary history which might account for a pattern of weak gains in the control groups. No measurable attitude change resulted as a product of instruction with the modules. Student and teacher feedback was a mixture of positive and negative comments.

Cluster Three:

Cluster three of the QUESST modules was called "U.S. Population Trends," and consisted of the modules entitled: "American Immigrants," "Rural-Urban Migration," "Problems: Population Data," and "Where People Are Going." Five teachers and 229 students from the seventh, eighth, ninth and eleventh grades completed both the attitude and knowledge test data for this cluster.

Knowledge Test Results:

The 25-item knowledge test for cluster three was shown to have a reliability (Chronbach's alpha) of α=.71 for the combined experimental and control group pretest scores and α=.76 for the combined posttest scores.

The analysis of covariance results indicated that the posttest scores were significantly affected by the covariate and the teacher/class factor. No other factor main effects or two-way interactions attained significance.

Table 10. below displays the statistics associated with these significant effects.

Table 10.

Cluster Three Knowledge Test Analysis of Covariance Results

Factor	F Ratio	Degrees of Freedom	Significance
Covariate	169.05	1,208	$p < .001$
Teacher/ Class	4.04	4,208	$p < .004$

The MCA table produced by SPSS as a part of the analysis of covariance procedure revealed that differences as large as 11.51 points (the standard deviation was 17.23 on the posttest scores) existed among the five teachers using the modules, while the largest difference between an experimental group and a control group was 2.69 points. The finding of a small difference in adjusted experimental and control group means is consistent with the lack of a treatment effect for cluster three modules.

Table 11. displays the results of the nonparametric tests conducted to determine whether significant pretest to posttest growth occurred in either the experimental or control groups. A quick inspection of the table reveals that none of the contrasts attained the specified $p < .01$ level of significance. This finding is consistent with the lack of treatment effect, and is further supported by the fact that only one of the experimental versus control group contrasts attained the required levels of significance. This contrast, which compared the third experimental group and the control group of teacher number two, favored the control group. Due to the lack of other significant findings, the tabled data for the other experimental versus control group contrasts is omitted.

Table 11.

Cluster Three Knowledge Test: Nonparametric[1] Gain Score Contrasts

Teacher	Group	Number of Increases	Number of Decreases	Z Value	Significance[2]
01	Exp (n=20)[a]	7(6.9)[b]	10 (10.5)	-1.35	p<.177 n.s.
	Ctrl (n=14)	8(7.6)	5(6.1)	-1.05	p<.295 n.s.
02	Exp 1(n=20)	11(8.0)	6(10.8)	-0.54	p<.586 n.s.
	Exp 2(n=19)	8(8.2)	8(8.2)	-0.13	p<.897 n.s.
	Exp 3(n=17)	5(8.0)	11(8.7)	-1.45	p<.148 n.s.
	Ctrl (n=29)	10(15.4)	18(14.0)	-1.12	p<.265 n.s.
03	Exp (n=23)	14(10.2)	4(7.0)	-2.50	p<.012 n.s.
	Ctrl (n=15)	8(7.9)	6(7.0)	-0.66	p<.509 n.s.
04	Exp (n=17)	11(9.8)	6(7.5)	-1.49	p<.136 n.s.
	Ctrl (n=11)	7(4.9)	2(5.3)	-1.42	p<.155 n.s.
05	Exp (n=19)	11(8.7)	5(8.0)	-1.45	p<.148 n.s.
	Ctrl (n=25)	12(11.8)	11(12.3)	-0.09	p<.927 n.s.
Combined					
	Exp (n=135)	67(57.2)	50 (61.4)	-1.04	p<.298 n.s.
	Ctrl(n=94)	45(45.0)	42(43.0)	-0.47	p<.642 n.s.

---

1. These are Wilcoxon's Matched-Pairs Signed-Ranks tests.
2. These are two-tailed probabilities.
a. These n's include cases showing no change.
b. These numbers are means of ranks.

Attitude Test Results

Cluster three attitude test results were shown to have a reliability (Chronbach's alpha) of α=.87 for the pretest and α=.90 for the posttest. Both of these reliability estimates were calculated on the combined experimental and control group scores.

An analysis of covariance conducted on the attitude test data indicated that only the covariate and a two-way interaction between experimental versus control membership and teacher/class characteristics accounted for significant variation in the posttest scores. The statistics associated with these two findings are displayed in Table 11.

Table 11.

Cluster Three Attitude Test Analysis of Covariance Results

Factor	F Ratio	Degrees of Freedom	Significanee
Covariate	77.47	1,208	$p < .001$
Group By Teacher/ Class	4.17	4,208	$p < .003$

An inspection of the MCA table revealed that experimental groups two and three of field test teacher number two demonstrated greatly depressed posttest attitude survey scores. These results are in contrast with the slightly increased posttest attitude survey scores for the control group of all the teachers taken as a whole. Since the SPSS Manual specifically cautions against making judgments based upon adjusted means displayed in the MCA table where strong interaction effects are noted (see SPSS Manual p.410 Nie, et al. 1975) it would seem advisable to withold any interpretation of this single finding.

Teacher and Student Comments:

The teacher feedback for cluster three modules indicated that in general the materials were easy to teach and that the teacher directions were clear. There was agreement that the amount of quantitative and topic background was right but some spread of opinions on how well the modules fit into the ongoing curriculum. Teachers made such comments as:

> "(These modules) Generated very high interest in nonmotivated students with low ability. Generated 'medium' interest in motivated, higher ability students."

> "Yes, (I) will attempt to use more quantitative techniques--feel more comfortable with them now."

"The unit dealing directly with immigration (worked best) as it fit into the ongoing curriculum quite well."

"The format is generally conducive to easy lesson planning."

"Stapling all student items together for each module was not helpful."

"They (the materials) suggested the importance and need to use these concepts and to teach about kinds of quantitative data sources relevant to history."

Student feedback for cluster three modules was varied. Asked what activity or lesson they liked best, a sample of the students replied:

"Immigration Causes because I liked the part when (I) found out about the different nationalities."

"Rural urban migration-we got to work in groups and it was better and funner than the others."

"Rural urban migration; American migration".

"Finding out who my ancestors were and when they came. It was the most interesting."

"I liked studying the graphs because you learn alot."

"Immigrants, Pop. Trends, Where are people going."

"None of it. Boring."

"Population growth charts because they are interesting."

"I don't really know, all were easy and interesting.

"None, it was not interesting."

"None--I thought it was very unnecessary plus very boring, I do enjoy history very much. But this very stupid, I feel that everybody knew very much about this. It was presented very good by Dr. Beery though. He did make it a little more interesting than it would have been."

"None--boring because I hate math. Also, who really cares about the population of an imaginary town or anything."

Asked what activity or lesson they liked least, a sample of the students replied:

"None they were all good."

"Finding the mean. Because I don't like division."

"I don't know."

"I didn't like figuring out percentages or doing the math parts, except mean and median".

"All of them boring."

"I liked all of them."

"American Immigrants--it was sort of boring and wasn't very fun."

"None, I liked them all very well."

"I disliked the QUESST activity where we learned about migration in our country."

Cluster Three Conclusion:

The available evidence indicates that the cluster three modules had no measurable importance on student's statistical knowledge or attitudes. Student comments were varied-showing both positive and negative reactions to all of the activities.

Cluster Four:

Cluster four of the QUESST modules was termed "Economic Issues in the United States." It consisted of four modules entitled: "What Americans Earn," "Income: His and Hers," "Rising Prices," and "Income and Prices." Four field test teachers with a total of 218 eighth, eleventh and twelfth grade students completed both the knowledge and attitude tests for cluster four. Knowledge test results are presented first followed by attitude survey results and selected comments of students and teachers.

Knowledge Test Results:

The Cluster four knowledge test was shown to have a reliability (Chronbach's alpha) of $\alpha = .78$ for the pretest and $\alpha = .85$ for the posttest. Both of these reliabilities were calculated on the combined experimental and control group scores.

The analysis of covariance results indicated that the posttest scores were significantly affected by the covariate (the pretest scores), experimental versus control group membership and teacher/class characteristics. No other main factor effects (i.e. sex or grade level) or two-way interactions attained significance. Table 12. displays the statistics associated with the noted significance factors.

Table 12.

Cluster Four Knowledge Test Analysis of Covariance Results

Factor	F Ratio	Degrees of Freedom	Significance
Covariate	188.12	1,199	$p < .001$
Group	15.96	4,199	$p < .001$
Teacher/ Class	4.75	3,199	$p < .003$

Table 12 indicates that there was significant treatment effect produced by the QUESST modules in cluster four. Experimental versus control group differences were as large as 22.61 points (the standard deviation of the posttest scores was 22.52). Differences among the teachers were as large as 12.89 points.

Table 13. displays the results of the nonparametric tests conducted to determine whether significant pretest to posttest growth occurred in either the experimental or control groups. As the table shows, all experimental groups experienced significant positive gains while all control groups failed to show any significant gains. These results are, of course supported by the overall (pooled) tests for the combined experimental and control groups. These findings support the conclusion that the cluster four modules had a significant impact on students' knowledge of quantitative (statistical) concepts. This conclusion may be examined further by contrasting the posttest scores of the experimental and control groups.

Table 13.

Cluster Four Knowledge Test: Nonparametric[1] Gain Score Contrasts

Teacher	Group	Number of Cases Showing Increases	Number of Cases Showing Decreases	ZValue	Significance[2]
01	Exp (n=32)[a]	30(17.4)[b]	2(2.5)	-4.84	$p<.001$
	Ctrl n.a.				
02	Exp (n=17)	14(8.8)	2(6.3)	-2.87	$p<.004$
	Ctrl (n=14)	4(7.1)	8(6.2)	-0.82	$p<.410$ n.s.
03	Exp (n=24)	20(11.4)	1(2.0)	-3.95	$p<.001$
	Ctrl (n=25)	11(10.0)	9(11.1)	-0.18	$p<.852$ n.s.
04	Exp 1(n=24)	18(13.8)	5(5.4)	-3.38	$p<.001$
	Exp 2(n=19)	16(10.2)	2(3.8)	-3.40	$p<.001$
	Exp 3(n=19)	17(9.8)	1(4.5)	-3.53	$p<.001$
	Exp 4(n=20)	17(11.9)	3(2.3)	-3.66	$p<.001$
	Ctrl (n=24)	10(8.9)	12(13.6)	-1.20	$p<.229$ n.s.
Combined	Exp (n=155)	132(80.3)	16(27.0)	-9.73	$p<.001$
	Ctrl(n=63)	25(25.6)	29(29.1)	-0.87	$p<.382$ n.s.

---

1. These are Wilcoxon's Matched-Pairs Signed-Ranks tests.
2. These are two-tailed probabilities.
a. These n's include cases showing no change.
b. These numbers are means of ranks.

Table 14. displays the nonparametric tests used to contrast the psottest performance of both groups.

Table 14.

Cluster Four Knowledge Test: Nonparameteric[1] Contrasts of Experimental and Control Group Posttest Scores

Teacher	Mean Rank Ctrl.Group	Mean Rank Exp. Group	Z Value	Significance[2]
01	n.a.			
02	11.6 (n=14)	19.6 (n=17)	-2.47	$p<.013$
03	18.4 (n=25)	31.9 (n=24)	-3.32	$p<.001$
04	22.6 (n=24)	62.6 (n=82)	-5.63	$p<.001$
Combined	83.5 (n=63)	120.1 (n=155)	-3.88	$p<.001$

---

1. These are Mann-Whitney U (Wilcoxon Rank Sum) tests.
2. These are two-tailed probabilities.

As Table 14. shows, all of the possible experimental versus control group contrasts attained significance at the required ($p<.01$) level. These results support the findings of the analysis of covariance and the gain score contrasts and lead to the conclusion of a strong knowledge impact for the cluster four modules of Project QUFSST.

Attitude Test Results:

Cluster four attitude test results were shown to have a reliability (Chronbach's alpha) of $\alpha=.87$ for the pretest and $\alpha=.90$ for the posttest. Both of these reliabilities were calculated on the combined experimental and control group scores.

An analysis of covariance indicated that only the covariate (the pretest attitude scores) accounted for significant variation in the posttest scores. The statistics associated with this finding were: F = 144.13 df 1,199 $p<.001$. No other factor main effects or two-way interactions attained significance. Consistent with this finding is the fact that none of the nonparametric gain score or experimental versus control group comparisons attained significance at the required $p<.01$ level.

Due to this set of circumstances, the tabled data for the cluster four attitude test is omitted. Selected and student comments follow.

Teachers using the cluster four modules felt that they were easy to teach, and that the teacher directions were clear. They felt that the amount of background provided was adequate and that the modules reised important questions and issues. Teachers made such comments as:

"Very seldom was there materials missing that I thought I needed--well done generally."

"It was easy to generate discussion. The four Economics units were redundant in several areas, however only local (logistical problems involving a secretarial strike and copying facilities."

"I could use parts of this material in my regular economics class."

"Because I understood the economic concepts and their use, I had no trouble with the modules. Other teachers might get in over their heads."

"Problems came when students did not comprehend mathematical relationships like percentages."

"I'm not sure how much the use of these materials in an economics course merely reinforced prejudices about statistical information."

"I found most of the materials to be clear and precise."

"Since the materials need to be used in proper order and distributed only when used, stapling all together made for an awkward situation."

Asked what activity or lesson they liked best, a sample of students responded:

"Salaries."

"Undecided."

"The salaries, it was interesting."

"The test."

"Studying the CPI, I learned what it meant."

"What Americans Earn. I learned what the average person gets for a salary for what you do. Now I know where my dad's salary stands compared to others."

"I liked the mean and median and stuff like that the best. There were the most interesting.

"Waht Americans Earn. It was fun."

"I liked learning about the mean, mode and median cause I got most of it right."

Asked what activity of lesson they liked least, a sample of students responded:

> "Consumer Price Index, I didn't understand it for a long time, then when you do understand its boring."
>
> "The rest of it was awful boring. I thought it should have been a little shorter, or not as drawn out."
>
> "Mean because it is mean. I like doing things the easy way."
>
> "Mean, median and mode--it was hard to figure the answers."
>
> "Consumer Price Index. Because I didn't understand what it was about."
>
> "Consumer Price Index. Boring."
>
> "I didn't like figuring out the price index 'cause I thought it was boring."
>
> "His/hers--figures outlandish--so obvious it was ridiculous."
>
> "The women versus men subject did not have any relevant data which could be discussed."
>
> "The graphs."
>
> "None."
>
> "The useless, redundant, immature, ridiculous, trivial, wasteful, incoherent. . . arithmetic."
>
> "The test because we took the same test three times and I thought it was rather boring."

Cluster Four Conclusion:

Cluster four modules had a strong impact on experimental group students with knowledge statistical concepts. No attitude impact was registered on either experimental or control group students. Teacher feedback was positive while student comments were mixed.

Cluster Five

Cluster five of the QUESST modules was termed "Energy Issues," and consisted of the modules entitled" "The Energy Crunch and the Numbers Game," "Consuming Energy," and "Energy: How Important in My Life?" Four field test teachers with a total of 183 seventh, eighth, tenth and twelfth grade students completed both the knowledge and attitude test data for this cluster. Knowledge test results are presented first, followed by attitude test results and comments from students and teachers.

Knowledge Test Results

The 25-item knowledge test for cluster five was shown to have a reliability (Chronbach's alpha) of $\alpha = .83$ for the pretest and $\alpha = .81$ for the posttest. Both of these reliabilities were calculated on the combined experimental and control group scores.

The analysis of covariance results indicated that the posttest scores were significantly affected by the covariate and experimental versus control group membership. No other factor main effects or two-way interactions attained significance. Table 15 displays the statistics associated with these effects.

Table 15.

Cluster Five Knowledge Test Analysis of Covariance Results

Factor	F Ratio	Degrees of Freedom	Significance
Covariate	250.00	1,163	$p < .001$
Group	5.49	4,163	$p < .001$

The MCA table produced by SPSS as a part of the analysis of covariance procedure revealed that differences in the adjusted posttest group means between the experimental and control group were as large as 13.83 points (the standard deviation was 19.14 points).

Table 16. shows the results of the nonparametric tests conducted to determine whether significant pretest to posttest growth occurred in either the experimental or control groups. The body of the table indicates that two of the seven experimental groups experienced significant knowledge gains. None of the control groups showed significant gains. The overall (pooled) results indicated that there was a statistically significant knowledge gain for the experimental but not the control group. These mixed results may be further examined by contrasting the posttest scores of the experimental versus control groups. Table 17. displays the results of these tests.

Table 16.

Cluster Five Knowledge Test: Nonparametric[1] Gain Score Contrasts

Teacher	Group	Number of Cases Showing Increases	Decreases	Z Value	Significance[2]
01	Exp (n=17)[a]	5(7.1)[b]	6(5.1)	-0.22	$p<.824$ n.s..
	Ctrl (n=16)	2(5.0)	9(6.2)	-2.04	$p<.041$ n.s.
02	Exp (n=17)	9(7.6)	6 (8.5)	-0.48	$p<.629$ n.s.
	Ctrl (n=10)	3(4.8)	5(4.3)	-0.49	$p<.624$ n.s.
03	Exp (n=9)	3(3.5)	5(5.1)	-1.05	$p<.294$ n.s.
	Ctrl (n=9)	5(4.4)	2(3.0)	-1.35	$p<.176$ n.s.
04	Exp 1(n=21)	15(11.2)	5(8.4)	-2.35	$p<.019$ n.s.
	Exp 2(n=19)	16(10.2)	2(4.3)	--3.35	$p<.001$
	Exp 3(n=23)	19(12.9)	4(7.8)	-3.25	$p<.001$
	Exp 4(n=19)	13(9.[illegible])	4(7.5)	-2.20	$p<.028$ n.s.
	Ctrl (n=23)	9(12.7)	12(9.8)	-0.05	$p<.958$ n.s.
Combined					
	Exp (n=125)	80(60.9)	32(45.5)	-4.95	$p<.001$
	Ctrl (n=58)	19(25.0)	28(23.3)	-0.94	$p<.349$ n.s.

---

1. These are Wilcoxon's Matched-Pairs Signed-Ranks tests.
2. These are two-tailed probabilities.

a. These n's include cases showing no change.
b. These numbers are means of ranks.

Table 17.

Cluster Five Knowledge Test: Nonparametric[1] Contrasts of Experimental and Control Group Posttest Scores

Teacher	Mean Rank Ctrl. Group	Mean Rank Exp. Group	Z Value	Significance[2]
01	n.a.			
02	14.3 (n=10)	13.8 (n=17)	-0.18	$p<.859$ n.s.
03	11.4 (n=9)	7.6 (n=9)	-1.51	$p<.131$ n.s.
04	37.1 (n=23)	57.5 (n=82)	-2.84	$p<.005$
Combined	92.6 (n=58)	91.7 (n=125)	-0.102	$p<.919$ n.s.

[1] These are Mann-Whitney U (Wilcoxon Rank Sum) tests.
[2] These are two-tailed probabilities.

The results of the experimental versus control group contrasts shown in Table 17. are consistent with the previous findings in revealing mixed results. Based on the available evidence, it seems that the knowledge treatment effect cluster five was manifested only in certain experimental group classes. Due to the lack of factor main effects for sex, grade level, or teacher or any two-way interactions, these results may only be explained by unassessed differences in class, school, or teacher characteristics and are therefore beyond the realm of the present analysis.

Attitude Test Results:

The cluster five attitude test was shown to have a reliability (Chronbach's alpha) of $\alpha=.88$ on the pretest and $\alpha=.89$ for the posttest. Both of these reliabilities were calculated on the combined experimental and control group scores.

An analysis of covariance indicated that only the covariace (the pretest scores) accounted for significant variation in the posttest scores. The statistics associated with this finding were: F=261.08 df 1,163 $p<.001$. No other factor main effects (sex, grade level, treatment, or teacher) or two-way interactions attained significance. Consistent with this finding is the fact that only one of the nonparametric contrasts attained significanct: the control group exhibited a significantly ($p<.006$) more negative posttest attitude toward statistics. Due to the lack of other significant contrasts, the tabled data for this cluster is omitted.

Teacher and Students Comments:

Teachers using the cluster five modules felt that the materials were easy to teach, and that the student materials were understandable. They agreed that the materials fit in well with their ongoing curriculum, and generated a moderate degree of interest in the students. They felt that there was sufficient variety in the activities, and that the materials raised some important questions and issues. Some comments from teachers included:

"It could easily be planned into our energy unit."

"I thought the modules did a good job of getting at questions that students could relate to their life."

"Scatter graphs are not clear."

"I have used some (quantitative ideas) in the past after using these materials I would not hesitate to use more in the future."

"No problems with estimated times. Some parts of the modules were a little advanced for 8th graders."

"I have never used them (quantitative ideas) much and would feel a little more confident in doing so (now)--hell, I never knew what exponential growth (was)."

Asked what they liked most about the module activities or lessons, a sample of students replied:

"The ones that show all the different things we use that use energy."

"Exponential growth, doubling of population, it was interesting."

"The energy sheet, because it was interesting."

"I enjoyed the reading materials."

"The one about the money being doubled, because it was interesting."

"I can't remember them all, but most were fun."

"None, because I didn't throughly understand the reason for doing them, however I did enjoy eating the cookies."

"I liked the film strips."

"When we figured out how much energy we spend."

Asked what they liked least about the modules, a sample of students replied:

"I didn't like some of the filmstrips."

"None, I liked them all."

"I guess I least liked (it) when we had to answer those questionaires, because the questions were boring."

"There wasn't enough of learning about statistics and how they work."

"The test on statistics I thought was a waste, for we really didn't do much with statistics."

"The one about making the pencil, it was not interesting."

"The survey one (on) how much energy you use in your home."

"The tests."

"Analyzing slides."

"The statistics test, it was boring."

"Charts and graphs-I didn't like it, I thought it was boring-not very interesting."

Cluster Six

Cluster six of the QUESST modules was termed "American Family and Consumer Issues," and consisted of the modules entitled: "Will the Real Average American Family Please Stand Up," "The Changing American Family," "There's a Sucker Born Every Minute," and "But How Do I Know Which One to Buy?" Seven field test teachers with 283 seventh, ninth and twelfth students completed the required pre-post knowledge and attitude test data for this cluster. Knowledge test results are presented first, followed by attitude test results and comments from students and teachers.

Cluster Five Conclusion

An overall knowledge test impact for cluster five was registered, but this effect was not uniformly distributed through all teacher experimental groups. No attitude impact was registered. Student and teacher feedback was predominately positive with a few notable exceptions.

Knowledge Test Results:

The 25-item knowledge test for cluster six was shown to have a reliability (Chronbach's alpha) of $\alpha=.50$ for the pretest and $\alpha=.71$ for the posttest. Both of these reliabilities were calculated on the combined experimental and control group scores.

The analysis of covariance results indicated that the posttest scores were significantly affected by the covariate experimental versus control group membership, teacher/class characteristics, and grade level. In addition, a group by teacher and group by grade interaction attained significance. The statistics associated with these effects are displayed in Table 18.

Table 18

Cluster Six Knowledge Test Analysis of Covariance Results

Factor	F Ratio	Degrees of Freedom	Significance
Covariate	45.07	1,264	$p<.001$
Group	19.53	2,264	$p<.001$
Teacher/ Class	5.52	6,264	$p<.001$
Grade	4.60	2,275	$p<.011$
Group By Teacher	4.69	5,264	$p<.001$
Group By Grade	8.54	2,275	$p<.001$

The MCA table revealed that differences in the adjusted posttest means between experimental and control groups were as large 9.07 points (the standard deviation of the posttest was 16.53); differences among teachers were as large as 14.11 points, and differences among grade levels were as great as 6.72 points. The interaction between group and grade level and between group and teacher/class may be due in part to the fact that older students tended to score lower than younger students, and the fact that no teacher taught more than one grade level of student.

Table 19. shows the results of the nonparametric tests conducted to determine whether significant pretest to posttest growth occurred in either the experimental or control groups. As shown in the table, three of the seven experimental groups showed significant increases in their statistical knowledge while none of the control groups showed such increases. The overall test for the combined experimental groups also showed a significant increase. These results are further explored in the experimental versus control group contrasts displayed in Table 20.

Table 19

Cluster six Knowledge Test: Nonparametric[1] Gain Score Contrasts

Teacher	Group	Number of Cases Showing Increases	Decreases	Z Value	Significance[2]
01	Exp (n=27)[a]	8(10.1)[b]	17(14.4)	-2.21	$p<.027$ n.s.
	Ctrl(n=14)	4(4.1)	8(7.7)	-1.77	$p<.078$ n.s.
02	Exp 1(n=15)	10(8.7)	5(6.6)	-1.53	$p<.125$ n.s.
	Exp 2(n=10)	7(4.4)	1(5.0)	-1.82	$p<.069$ n.s.
	Ctrl (n=22)	6(9.3)	9(7.2)	-0.26	$p<.798$ n.s.
03	Exp (n=22)	18(10.9)	3(11.8)	-2.78	$p<.005$
	Ctrl (n=24)	7(12.7)	15(10.9)	-1.22	$p<.223$ n.s.
04	Exp (n=23)	20(12.4)	2(2.8)	-3.92	$p<.001$
	Ctrl (n=20)	10(8.3)	5(7.5)	-1.28	$p<.201$ n.s.
05	Exp (n=25)	20(11.5)	2(11.3)	-3.38	$p<.001$
	Ctrl (n=24)	9(7.5)	12(13.6)	-1.67	$p<.095$ n.s.
06	Exp (n=28)	16(11.5)	5(9.5)	-2.36	$p<.018$ n.s.
	Ctrl (n=19)	6(7.5)	8(7.5)	-0.47	$p<.638$ n.s.
07	Exp (n=15)	7(8.5)	5(3.7)	-1.61	$p<.108$ n.s.
Combined	Exp (n=165)	106(76.8)	40(64.8)	-5.42	$p<.001$
	Ctrl(n=123)	42(45.5)	57(53.3)	-1.96	$p<.050$ n.s.

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1. These are Wilcoxon's Matched-Pairs Signed-Ranks tests.
2. These are two-tailed probabilities.

a. These n's include cases showing no change.
b. These numbers are means of ranks.

Table 20.

Cluster Six Knowledge TEst: Nonparametric[1] Contrasts of Experimental and Control Group Posttest Scores

Teacher	Mean Rank Ctrl. Group	Mean Rank Exp. Group	Z Value	Significance[2]
01	25.8 (n=14)	18.5 (n=27)	1.86	p<.062 n.s.
02	17.5 (n=22)	21.2 Exp 1 (n=15)	-1.03	p<.304 n.s.
	15.4 (n=22)	18.9 Exp 2 (n=10)	-1.01	p<.315 n.s.
03	19.1 (n=24)	28.3 (n=22)	-2.31	p<.021 n.s.
04	14.7 (n=20)	28.3 (n=23)	-3.57	p<.001
05	16.3 (n=24)	33.4 (n=25)	-4.20	p<.001
06	17.8 (n=19)	28.2 (n=28)	-2.58	p<.010
07	N.A.			
Combined	118.2 (n=123)	164.1 (n=165)	-4.64	p<.001

1. These are Mann-Whitney U (Wilcoxon Rank Sum) tests.
2. These are two-tailed probabilities.

The experimental versus control group comparison of posttest scores displayed in Table 20 shows that three of the seven possible comparisons attained significance at the required $p < .01$ level. In addition, the combined test showed a significant positive result. These results, taken together with the previous tests and the analysis of covariance indicate that the cluster six modules have a mixed treatment effect. An inspection of background information shows that this effect is strongest on seventh grade students.

Attitude Test Results

The cluster six attitude test was shown to have a reliability (Chronbach's alpha) of α= .88 for the pretest and α=.92 for the posttest. Each of these reliability estimates were calculated on the combined experimental and control group scores.

An analysis of covariance indicated that one posttest attitude scores for cluster six were significantly affected by the covariate (the pretest) and teacher/class characteristics. The statistics for these effects are displayed in Table 21.

Table 21.

Cluster Six Attitude Test Analysis of Covariance Results

Factor	F Ratio	Degrees of Freedom	Significance
Covariate	183.49	1,264	$p < .001$
Teacher/ Class	3.50	6,264	$p < .002$

An inspection of the MCA table revealed that differences as large as 9.31 points (the standard deviation was 15.27 on the combined experimental and control group posttest scores) existed among the seven different teachers. Two significant results were obtained in the series of post analysis of covariance nonparametric tests. Teacher number three showed a significant positive gain for the experimental group class ($p < .003$), but none for the control group class ($p < .284$). A second test which attained significance was the posttest attitude score contrast between the experimental and control groups taught by teacher number four. This test showed the posttest attitude of the experimental group to be significantly lower ($p < .010$) than their control comparison group. These results would tend to support the analysis of covariance finding that teacher/class differences accounted for a greater than chance level of variation in attitude toward statistics.

Teacher and Student Comments:

Teachers using the cluster six modules felt that they were of average difficulty to teach, that the teacher directions were clear and that the materials were of moderate to low interest to students. Most teachers felt that the amount of background provided on the topic was adequate, but there was a mixed reaction to the teacher's perceptions of how easy it was for their students to understand the materials. A sample of comments went as follows:

"The boxes used to explain the various concepts were most helpful. The questions with the answers were indeed one of the biggest helps."

"I myself have no knowledge of stats and of math in general--therefore I felt uneasy because I didn't have the background . . ."

"Materials offered too many suggestions for one specific area."

"Good background but it needs to be cut down."

"The use of mode, mean etc. was confusing to the students as well as myself in certain issues-example, family income mode. . . "

"I tried to teach the Econ unit to 8th graders and I think its a little advanced for them-some of it was fine but alot of it went over their heads."

"I thought the teacher materials were great."

"It fit well (into our curriculum) but a little too much for this level of kid-it was nice to get some economics into the class."

Asked what they liked most about the activities or lessons in these modules, a sample of students said:

"None, they had no relevant use therefore they were an assinine waste of time and money."

"P.E. It beats sitting down."

"A sucker. . ."

"None. Too boring."

"There's a sucker born every minute because I thought it was fun working with ads."

"Advertising unit--I liked to learn about what happens behind the scene of advertising."

"A Sucker Born Every Minute--It made me think about ads and made me more skeptical."

"Sampling of American families because it shows examples of real families."

"The Real American Family because it helped me realize what kinds of families there was and it was interesting."

"I liked the real American Family activity."

"Typical American Family because it was not boring to do--it was fun."

Asked what activity they liked least, students said such things as:

"School, don't like to get up in the morning."

"The Consumer because it was boring."

"I did not like consumerism because it did not interest me."

"Real American Family because I didn't like figuring out the math stuff."

"How are American families changing. Who cares about who likes children, what is happening to families, etc."

"Changing families--I HATE GRAPHS."

"The one that dealt with family units and there economic situations."

"A Real Average Family--It was very boring and to me was a waste of time. It was too elementary."

"No. I was not really interested about the Real Average Family and was made too basic for high school students so this shows the intelligence of our Government."

Cluster Six Conclusion:

The registered knowledge test impact of cluster six was evidenced primarily on seventh grade students. Attitude test results varied, but were primarily insignificant. Teacher comments were positive while student's comments were mixed.

Cluster Seven

Cluster seven of the QUESST modules was termed "American Lifestyle Changes," and consisted of the mdoules entitled: "The Automobile and the American Lifestyle," "Advances in Medical Technology," and "Warfare and Technology." Six teachers with a total of 218 eighth through twelfth grade students completed the necessary knowledge and attitude tests for this cluster.

Knowledge Test Results:

The cluster seven knowledge test was shown to have a reliability (Chronbach's alpha) of $\alpha = .65$ for the pretest and $\alpha = .71$ for the posttest. Both of these reliability estimates were calculated on combined experimental and control group scores.

The analysis of covariance results indicated that only the covariate (the pretest scores) accounted for significant variation in the posttest scores. The statistics associated with the effect of the covariate are: $F = 204.62$ df 1,197 $p < .001$. No other factor main effects or two way interactions attained significance. Nevertheless, nonparametric tests were conducted to determine whether statistically significant gains were registered in either the experimental or control groups, and also to compare the posttest scores of the experimental groups with their control groups. Only one of the eight experimental groups showed a significant gain ($p < .010$) from pretest to posttest. None of the control groups showed a significant gain, and neither of the combined experimental or control group tests attained significance. None of the experimental versus control group posttest score contrasts attained significance. Because of this lack of results, the tabled data for these tests not presented. A reasonable conclusion that can be drawn from these results is that there was no knowledge treatment effect for the cluster seven modules. Attitude test data are presented next followed by teacher and student comments.

Attitude Test Results:

The cluster seven attitude test was shown to have a reliability (Chronbach's alpha) of $\alpha = .90$ for the pretest and $\alpha = .91$ for the posttest. Both of these reliability estimates were calculated on the combined experimental and control group scores.

The analysis of covariance results indicated that the covariate, and the two-way interaction between group and teacher both accounted for greater than change variation in the posttest attitude scores. The statistics associated with these two effects were, respectively, $F = 279.11$ df 1,197 $p < .001$ (covariate) and $F = 3.29$ df 4.197 p .013 (group by teacher interaction).

As with previous clusters, only one of the post analysis of covariance contrasts proved to be significant. Specifically, this was an experimental versus control group contrast for teacher number six, which showed significant positive results favoring the experimental group. No other tests attained the required $p < .01$ level of significance. Because of this fact, tabled data for the attitude test results on cluster seven are omitted.

Teacher and Student Comments:

Teachers using the cluster seven modules agreed that they were moderately easy to teach and generated a mild interest in the part of the students. There was complete agreement that the modules lacked sufficient variety of activities, and that they fit moderately well into the ongoing curriculum. Selected teacher comments were:

> "Students had a hard time understanding why we were doing (studying) the unit."

> "Interest rate was high on topics the kids wanted to incorporate--but I would not let them--your test would not have been valid had I done so--when I did not pick up on their interest it went from 2 (low interest) to boring."

> "More explanation needed (in the teacher materials)."

> "No (these materials have not changed my ideas about using quantitative techniques) I don't feel the students looked at the materials quantitatively. Their interests were in discussion of content material."

> "I feel the modules could be revised and used for supplementary material for 8th graders. More teacher background material. More self explanatory quantitative data. More flexibility in incorporating current issues at hand."

"In some cases it seemed that the materials and the process were too easy for high school seniors."

"Some, like 'power shortage' were of very high appeal to kids. Tables did little to turn on the kids."

"Directions were clear--background was adequate."

"Automobile and medical technology worked into my unit on social and cultural change. The military stuff would have been better integrated with a unit on social conflict."

"Some questions were too simplistic."

"I felt the materials were quite easy for 12th grade sociology students. Kids felt that the activities for 'Med Tech' were repetitious and that each table was essentially more of the same stuff. . . Don't use last semester seniors for pilot teaching--they really fall out."

Asked what they liked best about the activities and lessons in the modules, a sample of students replied:

"The part on nuclear power because it informed me on things I didn't know."

"Nuclear Power because it was interesting to find out how powerful some other countries are."

"None."

"Nuclear bombs."

"War casualties, it was interesting."

"Nuclear weapons, it was something that I didn't know much about."

"The graphs--easiest to find."

"The one about wartime arms. It was interesting because we could be in a war at any time."

"I liked the one with the automobile because I really learned more about which places have more cars."

"Medical Tech."

"The medical stats. They provided more info and I learned a bit from them."

"I liked both the automobile and the medical activities that we did, because they told alot of accurate data that is true."

Asked what activities or lesson they liked least, the students said such things as:

"The medical technology, bacause though it was interesting, the car seemed to bring about more changes."

"We had them during senior slump."

"Medical. I am not interested in people who are going to die."

"Learning about pop distribution."

"They were all pretty good."

"The automobile, because it wasn't well worded and was hard to understand."

"Warfare, it was an old-fashioned approach and the statistics used were tedious and repetitious."

"?"

"The % and positive and negative line-graphs. Didn't understand what you meant by the graphs, and forgot how to find %!!"

"People killed in wars--depressing."

"The statistics about all the wars."

Cluster Seven Conclusion:

Cluster seven modules failed to have any knowledge or attitude impact. Teacher comments indicated the need for some revisions, while students made a mixture of positive and negative comments.

Cluster Eight

Cluster eight of the QUESST modules was called "American Government," and consisted of the modules entitled: "Two-Thirds Majority," "Give the People What They Want," "The Government Dollar," and "Pardon Me . . . But Your Image is Showing." Five teachers with a total of 229 ninth through twelfth grade students completed the necessary pre and posttests for this cluster. Knowledge test data are presented first, followed by attitude test data and comments from teachers and students.

Knwoledge Test Results:

The 25-item cluster eight knowledge test was shown to have a reliability (Chronbach's alpha) of $\alpha = .82$ for the pretest and $\alpha = .86$ for the posttest. Each of these reliability estimates were calculated on the combined experimental and control group scores.

The analysis of covariance results indicated that the posttest scores were significantly affected by the covariate (the pretest scores), experimental versus control group membership, teacher/class characteristics, and grade level. No other factor main effects or two-way interactions attained significance. Table 21, displays the statistics associated with the significant effects.

Table 21.

Cluster Eight Knowledge Test.Analysis of Covariance Results

Factor	F Ratio	Degrees of Freedom	Significance
Covariate	368.56	1,204	$p < .001$
Group	5.86	4.204	$p < .001$
Teacher/ Class	9.96	4,204	$p < .001$
Grade	13.53	3,206	$p < .001$

An inspection of the MCA table showed that differences as large as 13.75 points existed between the adjusted posttest means of experimental and control groups (the standard deviation was 22.59). Differences among the teachers were as large as 18.6 points, and those among the grade levels were as large as 17.92 points. Ninth graders outperformed all other grade levels, followed by seniors, tenth and finally eleventh graders. Two teachers with eleventh grade classes were both shown to have lower overall posttest means.

Table 22 shows the results of the nonparametric tests conducted to determine whether significant pretest to posttest gains occurred in either the experimental or control group.

Table 22.

Cluster Eight Knowledge Test: Nonparametric[1] Gain Score Contrasts

Teacher	Group	Number of Cases Showing		Z Value	Significance[2]	
		Increases	Decreases			
01	Exp (n=16)[a]	9(8.6)[b]	5(5.6)	-1.54	p .124	
	Ctrl (n=17)	5(5.4)	11(9.9)	-2.12	p .034	
02	Exp 1(n=11)	3(6.2)	8(5.9)	-1.29	p .197	
	Exp 2(n=21)	9(9.2)	8(8.8)	-0.28	p..776	
	Exp 3(n=9)	3(3.2)	6(5.9)	-1.54	p .124	
	Ctrl (n=12)	1(4.0)	10(6.2)	-2.58	p .009	sig.
03	Exp (n=12)	9(5.7)	2(7.3)	-1.64	p .100	
	Ctrl (n=16)	10 (8.2)	4(5.8)	-1.85	p .064	
04	Exp (n=17)	11(9.7)	5(5.8)	-2.02	p .044	
	Ctrl (n=10)	6(5.0)	3(5.0)	-0.89	p .374	
05	Exp 1(n=19)	16(9.8)	3(11.2)	-2.47	p .013	sig.
	Exp 2(n=26)	11(11.2)	11(11.8)	-0.11	p .909	
	Exp 3(n=24)	18(12.2)	4(8.4)	-3.02	p .003	
	Exp 4(n=17)	12(9.1)	4(6.8)	-2.12	p .034	
	Ctrl (n=2)	1(1.5)	1(1.5)	0.00	p 1.00	
Combined						
	Exp (n=172)	101(82.3)	56(73.0)	-3.70	p .001	sig.
	Ctrl(n=57)	23(22.8)	29(29.5)	-1.51	p .132	

1. These are Wilcoxon's Matched-Pairs Signed-Ranks tests.
2. These are two-tailed probabilities.

a. These n's include cases showing no change.
b. These numbers are means of ranks.

As table 22. shows, only two of the ten experimental groups showed a significant pretest to posttest gain. Despite this result, the overall combined experimental group gain test attained significance well beyond the required $p < .01$ level. It should be noted that one control group showed a significant decrease in its performance.

Table 23. shows the results of the nonparametric tests conducted to determine if there were significant differences in the posttest performance of the experimental versus the control group. An inspection of the table shows that four of the ten possible contrasts attained the required level of significance. Nevertheless, the overall test of the combined results attained significance at the required level. Taken together, the overall results would tend to support the judgment that there was a treatment effect on statistical knowledge imparted by the modules in cluster eight. Attitude test results follow.

Attitude Test Results:

The cluster eight attitude test was shown to have a reliability (Chronbach's alpha) of $\alpha = .88$ for the pretest and $\alpha = .90$ for the posttest. Each of these reliability estimates were calculated on the combined experimental and control group scores.

Table 23.

Cluster Eight Knowledge Test: Nonparametric^1 Contrasts of Experimental and Control Group Posttest Scores

Teacher	Mean Rank Ctrl. Group	Mean Rank Exp. Group	Z Value	Significance^2
01	11.4 (n=17)	22.9 (n=16)	-3.43	$p < .001$
02	8.5 (n=12)	15.9 Exp 1 (n=11)	-2.64	$p < .009$
	10.2 (n=12)	20.9 Exp 2 (n=21)	-3.08	$p < .002$
	8.4 (n=12)	14.4 Exp 3 (n=9)	-2.21	$p < .027$ n.s.
03	11.1 (n=16)	19.0 (n=12)	-2.57	$p < .010$
04	12.1 (n=10)	15.1 (n=17)	-0.97	$p < .331$ n.s.
05	1.8 (n=2)	12.0 Exp 1 (n=19)	-2.22	$p < .026$ n.s.
	3.0 (n=2)	15.4 Exp 2 (n=26)	-2.06	$p < .039$ n.s.
	1.5 (n=2)	14.5 Exp 3 (n=24)	-0.00	$p < 1.00$ n.s.
	3.0 (n=2)	10.8 Exp 4 (n=17)	-1.87	$p < .061$ n.s.
Combined	70.5 (n=57)	129.8 (n=172)	-5.87	$p < .001$

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[1] These are Mann-Whitney U (Wilcoxon Rank Sum) tests.

[2] These are two-tailed probabilities.

The analysis of covariance results indicated that only the covariate (the pretest) accounted for significant variation in the posttest attitude scores. The nonparametric tests conducted after the analysis of covariance confirmed the lack of a treatment effect in that only one teacher class showed a significant positive increase ($p<.006$) in attitude toward statistics. This same teacher's experimental group showed significantly higher ($p<.007$) posttest scores than the control comparison group. Because of the uniformity of insignificant results for all remaining teachers on the cluster eight attitude test, the tabled data will not be presented.

Teacher and Student Comments:

Teachers who used the cluster eight modules felt that they were easy to teach and had clear teacher directions. Some comments were:

> "The only problem was to try to keep the students interested in the topics."

> "Some of the tables and graphs were hard for the students to understand."

> "Some materials students found interesting, but the majority of the student handouts did not gain any interest."

> "Many topics that were discussed in the modules related very well to the subject."

> "The questions make each student think about the topics as well as their answer. Developed 'Thought Processes'."

> "Various mods created high interest--such as government spending (and) conducting a survey."

> "Government Spending . . . elicited questions that forced students to use thought process."

Asked which activities they liked best, a sample of students replied:

> "Everything but scatter graphs . . ."

> "Don't Look Now--It was the most fun."

> "Picking candidates for election-because it gave me an idea of what goes on and what voters do in an election."

> "I liked the survey and the scattergram."

> "The survey, because you really got to chose something to do of your own choice, and follow the steps on decision making."

> "The government spending; because in this you learned where all the money the government was spending was going and why they made certain cuts."

"Candidate Images, because it shows what type of an image a candidate needs if he is going to succeed in politics."

"None. They were boring."

Asked what activity or lesson they liked least, a sample of students responded:

"Can not decide."

"Senators--boring."

"Elected senators. Because it was boring."

"Graphing because it was hard for me to understand."

"Statistics, don't care for math."

"All, disliked all."

"Scattergrams; I felt that it didn't have too much importance."

"Studying charts and graphs--because it was boring."

"All of them."

"All was pretty good."

Cluster Eight Conclusion:

Despite a weak pattern of positive results, it is possible to conclude that the cluster eight modules had a significant positive impact on experimental group students' knowledge of statistical concepts. Available evidence indicated a lack of attitude impact for this cluster. Teacher's comments indicated some problems in getting and holding the students' interest. Students' comments were varied.